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ABSTRACT

Because of the high incidence of failure in algebra I among ninth-grade students, the Louisiana State Board of Elementary and Secondary Education requested the development of this guide with the intention of providing a good pre-algebra foundation. The purposes of the guide are to recognize standards that involve the application of mathematical rules to algebraic concepts and to provide the introduction of elementary algebra skills. Topic areas include: (1) "Whole Numbers"; (2) "Decimals"; (3) "Number Theory"; (4) "Fractions"; (5) "Ratio, Proportion, Percent"; (6) "Integers, Rational Numbers, Real Numbers"; (7) "Elementary Algebra"; (8) "Linear Equations and Inequalities of One Variable"; (9) "Probability and Statistics"; and (10) "Geometry." The curriculum outline and its performance objectives are listed. Activities, activity answer keys, and evaluation techniques are listed for each objective. A bibliography, and listings of state-approved textbooks for grade 8, and supplements, are included. Materials about terminology, subsets of real numbers, extracting square root, problem solving strategies, and polygon activity are appended. (YP)

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STATE OF LOUISIANA
DEPARTMENT OF EDUCATION

INTRODUCTION TO ALGEBRA CURRICULUM GUIDE

Grade 8

Bulletin 1802
1987

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STATE OF LOUISIANA

DEPARTMENT OF EDUCATION

INTRODUCTION TO ALGEBRA
CURRICULUM GUIDE

Grade 8

Bulletin 1802

1987

Issued by

Office of Academic Programs

Thomas G. Clausen, Ph.D.
Superintendent

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FOREWORD

Curriculum guides have been developed for grades K-8 at the elementary level and for each mathematics course at the secondary level. These guides represent the best thinking of a selected statewide committee established to determine the scope of mathematics content which should be taught at each level.

The mathematics curriculum guides are another segment of the total educational program mandated by the Legislature in both the accountability and assessment and the competency-based education laws. This educational program requires that specific skills and concepts be established for each grade level and for each subject area. The mathematics curriculum guides with course outlines, performance objectives and coordinated activities effect this phase of the program.

It is hoped that the mathematics curriculum guides will make a major contribution to the improvement of mathematics instruction in the schools of Louisiana.

Thomas G. Clausen

Thomas G. Clausen, Ph.D.

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ACKNOWLEDGMENTS

The Introduction to Algebra Curriculum Writing Committee is to be commended for its work in the development of the Introduction to Algebra Curriculum Guide. Leadership for this project was provided by Dr. Jean Reddy Clement, Section Chief, Mathematics Section, Bureau of Secondary Education; Mr. Roy Coats, Supervisor, Bureau of Curriculum, Inservice, and Staff Development; Mrs. Catherine Hill, mathematics teacher, Mangham High School; and Mrs. Gwen Barsley, mathematics teacher, S. J. Barbre Middle School.

The Introduction to Algebra course was written by a committee of classroom mathematics teachers and central office staff supervisors under the direction of Dr. Clement and Mr. Coats. These dedicated educators deserve special commendation for the quality of this curriculum guide which will enhance the middle school mathematics program immeasurably.

William E. Stephens, Jr.
Assistant Superintendent
Office of Academic Programs

Helen Brown, Ed.D., Director
Bureau of Curriculum, Inservice,
and Staff Development

P. Edward Cancienne, Ph.D.
Director
Bureau of Secondary Education

INTRODUCTION TO ALGEBRA CURRICULUM WRITING COMMITTEE

Ms. Catherine Hill, Chairman
Mangham High School
Mangham, LA 71259

Ms. Juanita Lee
Mathematics Curriculum Coordinator
Evangeline Parish School Board
1101 Te Mamou Road
Ville Platte, LA 70586

Dr. David Gullatt, Principal
Simsboro High School
P. O. Box 118
Simsboro, LA 71275

Ms. Maria Maggio
Monroe City School Board
P. O. Box 4180
Monroe, LA 71203

Mrs. Althia Fuller
Caddo Parish School Board
P. O. Box 32000
Shreveport, LA 71130

Dr. Jean Reddy Clement
Section Chief, Mathematics
Louisiana Department of Education
P. O. Box 94064
Baton Rouge, LA 70804-9064

Mr. Roy Coats, Supervisor
Curriculum, Inservice,
and Staff Development
Louisiana Department of Education
P. O. Box 94064
Baton Rouge, LA 70804-9064

INTRODUCTION TO ALGEBRA CURRICULUM REVISION COMMITTEE

Mrs. Gwen Barsley, Chairman
S. J. Barbre Middle School
Kenner, LA 70062

Mrs. Judy Pippin
Natchitoches Ninth Grade Center
Natchitoches, LA 71457

Ms. Loraine Woods
Broadmoor Senior High School
Baton Rouge, LA 70815

Dr. Jean Reddy Clement
Section Chief, Mathematics
Louisiana Department of Education
P. O. Box 94064
Baton Rouge, LA 70804-9064

Mr. Roy Coats, Supervisor
Curriculum, Inservice, and Staff Development
Louisiana Department of Education
P. O. Box 94064
Baton Rouge, LA 70804-9064

LOUISIANA DEPARTMENT OF EDUCATION PERSONNEL

Bureau of Curriculum, Inservice, and Staff Development

Dr. Helen Brown, Director
Mr. Roy Coats, Supervisor

Bureau of Secondary Education

Dr. P. Edward Cancienne, Director
Dr. Jean Reddy Clement, Section Chief,
Mathematics

INTRODUCTION

The Louisiana State Board of Elementary and Secondary Education in May, 1984, mandated changes in mathematics graduation requirements for all students, effective with incoming freshmen beginning with the 1985-86 school session. The mathematics curriculum required of all high school students must include Algebra I, Algebra II and Geometry, or Algebra II or Geometry and one of the following: Advanced Mathematics, Calculus, Consumer Mathematics, or Business Mathematics.

Because of the high incidence of failure in Algebra I among ninth grade students, the State Board in July, 1986, requested that the Department develop an Introduction to Algebra Curriculum Guide for the expressed purpose of providing eighth grade students with a good pre-algebra foundation. This guide has been developed by a representative group of mathematics teachers and supervisors, working under the direction of Departmental mathematics and curriculum staff members. The course was piloted during the second semester of the 1986-87 school session and revised during the summer of 1987. Beginning in 1988-89, Introduction to Algebra is required in grade eight as the mathematics curriculum for academically able students in mathematics.

RATIONALE

The purpose for the development of the Introduction to Algebra guide is two-fold:

- To recognize standards that involve the application of mathematical "rules" to algebraic concepts.
- To recognize that, in order for students to exit the eighth grade ready for Algebra I, the introduction of elementary algebra skills is necessary.

It is further intended that this guide is to provide concentration on the expansion of skills relative to algebra, geometry, statistics, probability, and problem solving for the more mathematically mature eighth grade student. In carrying out this intent, the goal of this committee, as charged by the Board of Elementary and Secondary Education, is to develop a program that will assure the strong mathematical foundation which students must acquire before entering Algebra I in the years beyond 1986-87.

Finally, the committee recognizes that this guide is a blueprint of eighth grade mastery skills and elementary algebra skills. The sequencing of these skills is left to the discretion of the instructor.

GOALS

Upon completion of Introduction to Algebra, the student will be able to:

1. Perform operations with rational numbers and percent.

2. Recognize and use the properties of real numbers, the symbols of mathematics, and the language of algebra.

3. Develop an understanding of elementary algebra, including number theory and operations on polynomials (monomials).

4. Solve linear equations and inequalities of one variable and graph their solutions.

5. Demonstrate an understanding of probability and statistics.

6. Demonstrate a basic knowledge of coordinate geometry.

7. Prove a working knowledge of formulas.

8. Show a strengthened mathematical background and preparedness for algebra.

PACING CHART

The following pacing chart contains suggested periods of time to devote to each major topic in this curriculum guide. Because students learn at different rates and available teaching time during the school year is affected by many other variables, this pacing chart is based on thirty weeks of school. The remaining six weeks may be used as the teacher thinks best. Ample optional and supplementary materials are included for enrichment.

	TOPIC	NUMBER OF DAYS
I.	Whole Numbers	2
II.	Decimals	3
III.	Number Theory	10
IV.	Fractions	10
V.	Ratio, Percent, Proportion	15
VI.	Integers, Rational Numbers, Real Numbers	25
VII.	Elementary Algebra	10
VIII.	Linear Equations and Inequalities of One Variable	40
IX.	Probability and Statistics	10
X.	Geometry	25
		150

CURRICULUM OUTLINE AND PERFORMANCE OBJECTIVES

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
I. Whole Numbers	
A. As outlined in the 1986 revised edition of the Louisiana Department of Education Mathematics Curriculum Guide, K-8, operations on whole numbers should have been mastered prior to grade eight. (Review as needed.)[1]	
B.[2] Problem solving	The student will be able to solve appropriate word problems involving the addition and subtraction of measurements of:
1. Length	1. Length using customary system (inches, feet, yards) and the metric (SI) system (meters, centimeters).
2. Weight	2. Weight using the customary system (ounces, pounds) and metric (SI) system (kilograms, grams).
3. Capacity	3. Capacity using the customary system (cups, pints, quarts, half gallons, gallons) and metric (SI) system (liters, milliliters).
II. Decimals	
A. As outlined in the 1986 revised edition of the Louisiana Department of Education Mathematics Curriculum Guide, K-8, operations involving decimals should have been mastered prior to grade eight. (Review as needed.)[1]	

[1] Review material has been provided in the activity section.
[2] Eighth grade mastery skill

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
II. B.[1] Decimal equivalent	B. The student will be able to identify decimal numbers equivalent to: 1. Common fractions 2. Mixed numbers
C. Problem solving	C. Solve appropriate word problems involving the use of money in everyday life situations.
III. Number theory	To demonstrate an understanding of number theory, the student will be able to:
A. Divisibility tests	A. Recognize numbers that are (evenly) divisible by two, three, four, five, six, nine, and ten.
B. Prime factors	B. 1. Define and identify prime and composite numbers. 2. Identify the factors and prime factors of a number between 1 and 100. 3. Write a number as the product of its prime factors (17 or less).
C. Exponents	C. 1. Define and identify bases and exponents. 2. Write the exponential form of a power of ten given in standard form (e.g., express 100 as 10^2 or 1000 as 10^3).[1] 3. Extract the square root of a number that is a perfect square such as $\sqrt{25}$. 4. Write the standard form of a number given in exponential form, including zero as an exponent (e.g., express 6^3 as 216).[1]

[1]Eighth grade mastery skill

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
III. C. Exponents	5. Identify factored form and exponential form in addition to writing a product of a variable as a power of that variable (e.g., express $x \cdot x \cdot x$ as x^3).
D. Greatest common factor (GCF)	D. Use prime factors to determine the greatest common factor of two or more numbers.
E. Least common multiple (LCM)	E. Use prime factors to determine the least common multiple of two or more numbers.
F. Scientific notation	F. 1. Express numbers in scientific notation (e.g., express 6000 as 6×10^3). 2. Interpret numbers given in scientific notation (e.g., read 6×10^3 as 6000).
G. Order of operations 1. With exponents and without grouping symbols. 2. With exponents and with grouping symbols.	G. Perform multiple operations 1. With exponents and without grouping symbols, such as $5 \cdot 6^2 + 4^3 \div 2 - 8$. 2. With exponents and with grouping symbols, such as $5 \cdot (6^2 + 4^3) \div 2 - 8$.
IV. Fractions	
A. As outlined in the 1986 revised edition of the Louisiana Department of Education Mathematics Curriculum Guide, K-8, operations involving fractions should have been mastered prior to grade eight. (Review as needed.)[1]	
B.[2] Multiplication	B. The student will be able to remove factors from numerator and denominator before multiplying (cancellation).

[1]Review material has been included in the activity section.
[2]Eighth grade mastery skill

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
IV. C. Problem solving	C. The student will be able to solve appropriate word problems involving the use of money in everyday life situations.
V. Ratio, proportion, percent	To demonstrate an understanding of the operations, the student will be able to:
A. Ratio	A. Write ratios as fractions.
B. Proportion	B. 1. Identify equivalent ratios as proportions.[1] 2. Define and identify the parts (terms) of a proportion: means and extremes. 3. Solve for the missing term of a proportion (e.g., 1:2= __:4 and $\frac{1}{2} = \frac{x}{4}$).
C. Percent	C. 1. Change proper and improper fractions or mixed numbers to percents.[1] 2. Change a percent to a decimal number. 3. Change a percent to a fraction in lowest terms. 4. Find the percent of increase or decrease.[1] 5. Use percentages less than one percent.[1] 6. Solve the three types of percent problems: finding rate, base, and percentage. 7. Distinguish between simple and compound interest.[1] 8. Define straight salary and commission.[1]
D. Problem solving with application	D. Solve appropriate word problems involving 1. The computation of simple interest.[1] 2. The computation of price and sale price, tax, discount, and rate of discount.[1]

[1]Eighth grade mastery skill

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
VI. Integers, rational numbers, and real numbers	To develop an understanding of integers, rational numbers, and real numbers, the student will be able to:
A. Terminology	A. Define and identify 1. Natural numbers 2. Whole numbers 3. Integers 4. Rational numbers 5. Irrational numbers 6. Real numbers
B. Construction 1. Coordinate of a point 2. Assign a number.	B. Construct a number line and 1. Identify the coordinate of a point. 2. Plot a designated point.
C. Subsets	C. Diagram the subsets of the real number system.
D. Graphs of subsets	D. On separate number lines, graph the various subsets of the real numbers.
E. Absolute value	E. Define and determine the absolute value of any real number.
F. Operations	F. Perform the operations of 1. Addition, subtraction, multiplication and division of integers. 2. Addition, subtraction, multiplication and division of rational numbers.
G. Order of operations	G. Apply the rules for order of operations when performing multiple operations on real numbers, with or without grouping symbols.
H. Properties	H. Recognize and use *1. Closure properties 2. Commutative properties

*All items are mandatory unless preceded by an asterisk.
Items with an asterisk should be taught if time permits.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
VI. H. Properties	3. Associative properties 4. Additive identity properties 5. Multiplicative identity properties 6. Additive inverse 7. Multiplicative inverse (reciprocal) 8. Distributive property 9. Multiplicative property of 0 10. Property of substitution
I. Problem solving and application	I. Solve appropriate word problems involving the use of operations with real numbers.
VII. Elementary algebra (Because the basic eighth grade text does not address these concepts, supplemental material has been provided.)	To demonstrate an understanding of the elementary Algebra concepts, the student will be able to:
A. Evaluate expressions	A. Evaluate an algebraic expression given a replacement set for the variable(s), using the property of substitution.
B. Operations on polynomials 1. Combine like terms.	B. Perform operations on polynomials. 1. a) Define the term monomial. b) Define and identify like terms. c) Define binomial, trinomial, polynomial. d) Add and subtract polynomials (monomials, binomials, trinomials).

CURRICULUM OUTLINE			PERFORMANCE OBJECTIVES
VII. B.	2.	Multiplication of monomials	2. Multiply two or more monomials.
	3.	Multiplication of a polynomial by a monomial	3. Multiply a polynomial by a monomial. (Distributive Property)
	4.	Divide monomials	4. Divide a monomial by a monomial
C.		Factoring monomials	C. Use prime factors to determine the GCF and/or LCM of two or more monomials such as $10a^2b$ and $15ab^2$.
VIII.		Linear equations and inequalities of one variable	To demonstrate an understanding of linear equations, the student will be able to:
A.		Terminology	A. Define these terms: 1. Equation 2. Open sentence 3. Replacement set 4. Root 5. Solution set 6. Linear equation 7. Reflexive property 8. Symmetric property 9. Transitive property
B.		Solutions of linear equations in one variable	B. 1. Solve equations using these properties of equality: a) Addition b) Subtraction c) Multiplication d) Division 2. Solve equations involving more than one operation. 3. Show the solution of a linear equation on a number line. 4. Solve equations having variables on both sides.

CURRICULUM OUTLINE		PERFORMANCE OBJECTIVES	
VIII. C.	Graphing		
1.	Terminology	C. 1.	Define these terms: a) Rectangular coordinate system b) Ordered pair c) Horizontal and vertical axis d) Origin e) Quadrants f) Abscissa g) Ordinate
2.	Location of points using the rectangular coordinate system	2.	Locate and relate points in the plane to ordered pairs of numbers.
3.	Linear equations	3.	Solve and graph linear equations in two variables using the rectangular coordinate system.
D.	Problem solving	D. 1.	Translate verbal expressions to algebraic expressions and vice versa.
		*2.	Use linear equations to solve word problems involving number relations such as number, consecutive integer, geometry, distance, coin, and age problems.
E.	Solutions of linear inequalities in one variable	E. 1.	Find the solution set of a linear inequality in one variable.
		2.	Graph the solution set of a linear inequality in one variable.

*All items are mandatory unless preceded by an asterisk.
Items with an asterisk should be taught if time permits.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
IX. Probability and statistics	To demonstrate an understanding of probability and statistics, the student will be able to:
A. Graphs	A. 1. Interpret information presented in maps, charts, and tables. 2. Construct, interpret, and use data from pictographs, bar graphs, circle graphs, and line graphs.
B. Probability[1]	B. 1. Find the probability involved in a coin toss, the roll of a die, a turn of a spinner, or a draw of marbles or cards. 2. Interpret probability statements encountered in everyday situations.
C. Statistics[1]	C. Find the mean, mode, median, and range of a set of data.
D. Problem solving[1]	D. Solve appropriate word problems and critical thinking problems involving graphs, probability, and statistics.

[1]Eighth grade mastery skill

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
X. Geometry	To demonstrate an understanding of geometry, the student will be able to:
A. Terminology	A. Identify 1. The terms and symbols (where applicable) a) Point b) Line c) Ray d) Line segment e) Plane f) Angle g) Adjacent angles h) Complimentary angles i) Supplementary angles j) Vertical angles k) Parallel lines l) Perpendicular lines m) Transversal n) Corresponding angles o) Alternate interior and exterior angles p) Circle q) Polygon r) Triangle s) Quadrilateral
B. Angles	B. 1. Define and classify angles as acute, obtuse, right, or straight. 2. Identify congruent angles. 3. Recognize that the sum of the measures of the interior angles of a triangle is 180°. 4. Measure and draw angles using a protractor (up to 180°). 5. Construct an angle using a straight edge and compass.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
C. Circles[1]	C. 1. Identify[1] the a) Center. b) Radius. c) Diameter. d) Circumference. e) Semi-circle. f) Chord. g) Arc. h) Central angle.
	2. Recognize and use π in fractional ($\pi \approx \frac{22}{7}$) or decimal ($\pi \approx 3.14$) form.
	3. Determine the area and circumference of a circle.
D. Polygons 1. Regular	D. 1. a) Define a regular polygon. b) Identify and classify 3 - 10 sided polygons.

[1]Eighth grade mastery skill

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
X. D. 2. Irregular	2. a) Define an irregular polygon b) Construct irregular polygons
E. Triangles[1]	E. 1. Identify the altitude and base of a triangle. 2. Classify triangles according to sides (scalene, isosceles, equilateral). 3. Classify triangles according to their angles (acute, right, obtuse). 4. Identify the parts of a right triangle (hypotenuse, legs). 5. Determine the area of a triangle.[1] 6. Use the Pythagorean rule.[1]
F. Quadrilaterals	F. 1. Identify a a) Square. b) Rectangle. c) Trapezoid. d) Parallelogram. e) Rhombus. 2. Identify the altitude and base(s) of a trapezoid and parallelogram. 3. Determine the area of a a) Square. b) Rectangle. c) Parallelogram.[1] d) Trapezoid.
G. Similar and Congruent Figures	G. Recognize similar and congruent figures.
H. Problem solving[1]	H. Solve appropriate word problems involving the 1. Volume of a) Cubes. b) Rectangular solids. c) Pyramids. d) Spheres. e) Cones. f) Cylinders.

[1]Eighth grade mastery skill

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
H. Problem solving[1]	2. Conversion of area measures a) In customary units ($in.^2$ to $ft.^2$ to $yd.^2$; $yd.^2$ to $ft.^2$ to $in.^2$). b) In metric (SI) units, (cm^2 to m^2; m^2 to cm^2).

[1]Eighth grade mastery skill

ACTIVITIES[1]

[1]Because of the review materials provided for whole numbers, decimals, and fractions, these sections of the activities and the curriculum outlines do not match. To locate activities in a specific skill, see the activities outline. Items for student work are listed under objectives in the activities section.

ACTIVITIES

I. Whole Numbers: Review and/or pretest material except where indicated by an asterisk. Objectives marked by an asterisk are for eighth grade mastery.

I. A. (Review) CONTENT: Whole numbers; Addition

OBJECTIVE: The student will be able to
1. Find the sum of whole numbers.
2. Evaluate expressions involving addition.

I. A. 1. ACTIVITIES: 1. Find the sum.

a)
$$\begin{array}{r} 472 \\ 348 \\ 723 \\ \underline{965} \end{array}$$

b)
$$\begin{array}{r} 27{,}548 \\ 34{,}276 \\ 76{,}482 \\ \underline{52{,}268} \end{array}$$

c)
$$\begin{array}{r} 283{,}464 \\ 845{,}127 \\ 462{,}293 \\ \underline{573{,}899} \end{array}$$

d) $5 + 6 + 7$
e) $19 + 263$
f) $24 + 65 + 183$

I. A. 2. 2. Evaluate these expressions.

a) $n + 9$ where $n = 5$
b) $x + 6$ where $x = 8$
c) $a + 14$ where $a = 29$
d) $y + 231$ where $y = 63$
e) $b + 5 + 9$ where $b = 7$
f) $n + 15 + 84$ where $n = 37$

I. B. (Review) CONTENT: Whole numbers; Subtraction

OBJECTIVE: The student will be able to

1. Subtract whole numbers.
2. Evaluate expressions involving subtraction.

I. B. 1. ACTIVITIES: 1. Find the difference.

a)
$$\begin{array}{r} 418 \\ \underline{273} \end{array}$$

b)
$$\begin{array}{r} 38{,}750 \\ \underline{13{,}503} \end{array}$$

c)
$$\begin{array}{r} 974{,}823 \\ \underline{289{,}379} \end{array}$$

d)
$$\begin{array}{r} 6{,}278{,}322 \\ \underline{2{,}984{,}625} \end{array}$$

e) $761 - 149$
f) $475 - 268$
g) $1{,}345 - 796$

I. Whole Numbers

I. B. 2. 2. Evaluate these expressions.

a) $x - 9$ if $x = 12$.
b) $n - 13$ if $n = 22$.
c) $b - 36$ if $b = 54$.
d) $c - 213$ if $c = 479$.
e) $y - 900$ if $y = 2,291$.
f) $x - 4,621$ if $x = 27,105$.

I. C. (Review) CONTENT: Whole Numbers; Multiplication.

OBJECTIVE: The student will be able to

1. Multiply whole numbers.
2. Evaluate expressions involving multiplication.

I. C. 1. ACTIVITIES: 1. Find the product.

a) $\begin{array}{r} 43 \\ \times\ 74 \end{array}$ b) $\begin{array}{r} 562 \\ \times\ 436 \end{array}$ c) $\begin{array}{r} 8,574 \\ \times\ 385 \end{array}$

d) $(45)(39)$
e) $(96)(124)$
f) $(465)(132)$
g) $16 \cdot 5$
h) $(279)(8)$

I. C. 2. 2. Evaluate these expressions.

a) $5b$ if $b = 7$.
b) $8a$ if $a = 9$.
c) $26y$ if $y = 38$.
d) $123x$ if $x = 271$.

I. D. (Review) CONTENT: Whole Numbers; Division

OBJECTIVE: The student will be able to

1. Divide whole numbers.
2. Evaluate expressions involving division.

I. D. 1. ACTIVITIES: 1. Find the quotient. Express the remainder as a fraction.

a) $6\overline{)42}$ b) $7\overline{)917}$ c) $5\overline{)862}$

d) $9\overline{)3672}$ e) $61\overline{)10,553}$

f) $654 \div 6$
g) $274 \div 23$
h) $6,835 \div 721$
i) $34,582 \div 226$

I. Whole Numbers

I. D. 2.

2. Find the quotient. Express the remainder as a fraction.

a) $\frac{x}{6}$ if $x = 48$.

b) $81 \div n$ if $n = 9$.

c) $48 \div y$ if $y = 6$.

d) $1{,}683 \div x$ if $x = 3$.

e) $y \div 41$ if $y = 14{,}842$.

I. E. (Review) CONTENT: Whole Numbers; Order of operations

OBJECTIVE: The student will be able to perform multiple operations

1. Without grouping symbols.
2. With grouping symbols.

I. E. 1. ACTIVITIES:

1. Perform the indicated operations.

a) $5 + 3 \cdot 7$
b) $15 - 6 \cdot 2$
c) $16 \cdot 8 \div 2$
d) $24 \div 2 \cdot 3 + 6 \cdot 2 \div 3$
e) $36 \div 9 - 3 + 6 \div 2$

I. E. 2.

2. Perform the indicated operations.

a) $3(6 - 2) + 5$
b) $12 - (3 - \frac{1}{2})$
c) $36 \div (9 \cdot 2)$
d) $24 \div (2 \cdot 3) + 6(12 \div 3)$
e) $48 \div (2 + 6) + 4(8 \div 2)$
f) $2\,[3\,(4 - 2) + 18 \div (2 \cdot 3)]$

I. F. (Review) CONTENT: Whole numbers; Properties

OBJECTIVE: The student will be able to recognize and use the

1. Closure properties.
2. Commutative properties.
3. Associative properties.
4. Additive identity properties.
5. Multiplicative identity properties.

I. Whole Numbers

I. F. ACTIVITIES: Name the property that justifies each of the following:

a) $7 + 0 = 7$
b) $4 + 5 = 5 + 4$
c) $3 + 4$ is a whole number
d) $(3)(4) = (4)(3)$
e) $6 + (7 + 8) = (6 + 7) + 8$
f) $5 \cdot 1 = 5$
g) $a + b = b + a$
h) $3 \cdot 4$ is a whole number
i) $x \cdot y = y \cdot x$
j) $(4)(5 \cdot 6) = (4 \cdot 5) \cdot 6$
k) $b \cdot 1 = b$
l) $(3 \cdot 4) \cdot 5 = 3 \cdot (4 \cdot 5)$
m) (a)(b) is a whole number
n) $a+(b+c) = (a+b)+c$
o) $c + 0 = 0$
p) $x \cdot (y \cdot z) = (x \cdot y) \cdot z$

I. G. CONTENT: Whole numbers; Problem solving

OBJECTIVE: *The student will be able to solve verbal problems involving the addition and subtraction of measurement of

1. Length.
2. Weight.
3. Capacity.

I. G. 1. ACTIVITIES: 1. Solve the following:

a) Jane is 5 ft. 8 in. tall. Her younger sister is 3 ft. 2 in. tall. How much taller is Jane?

b) The rectangular building in which spacecraft are assembled at Cape Kennedy in Florida is 199 meters long and 144 meters wide. Find the perimeter.

c) Jamestown is located 24 kilometers north of Jonesville. Lincoln is located 72 kilometers south of Jonesville. If Henry is going to travel from his home in Jamestown to Lincoln, how far will he have to travel?

I. G. 2. 2. Solve the following:

a) Bob and Ken both cut and wrap meat. Bob cut 47 lbs. 3 oz. Ken cut and wrapped 49 lbs. 6 oz. Find the amount both cut and wrapped.

I. Whole numbers

I. G. 2. b) A trailer was loaded with 254 kg of bricks. John unloaded 163 kg of bricks. How many kilograms of bricks were left on the trailer?

I. G. 3. 3. Solve the following:

a) Ann determined that she would reserve a quantity of her homemade punch by retaining one gallon, one quart. She made four gallons, two quarts. What amount did she use?

b) Mike's automobile has a gas tank that will hold 50 liters. When Mike fills his tank, it holds 32 liters of gasoline. How many liters of gasoline were in the tank before it was filled?

II. Decimals: Review and/or pretest material except where indicated by an asterisk.

II. A. (Review) CONTENT: Decimals; Place value

OBJECTIVE: The student will be able to read and write decimal numbers from trillions to millionths.

II. A. 1. ACTIVITIES: 1. Write the decimal equivalents using words.

a) 3.46
b) 10.101
c) 7.000163
d) 2,463,712,138.4178
e) 168,719,503,425,106.216

II. A. 2. 2. Write the decimal equivalents using numerals.

a) Three and five thousandths
b) One and eight hundred seventy-five ten-thousandths
c) Two hundred eighty-four and fifteen ten-thousandths
d) Ten million, one hundred forty-two and nine tenths
e) Five thousand eight and twenty-three millionths

II. B. (Review) CONTENT: Decimals; Addition

OBJECTIVE: The student will be able to

1. Find the sum of decimals.
2. Evaluate expressions involving addition.

II. Decimals

II. B. 1. ACTIVITIES: 1. Add

a) $\begin{array}{r} .5312 \\ +\ .7439 \\ \hline \end{array}$ b) $\begin{array}{r} 96.39 \\ +\ .4658 \\ \hline \end{array}$ c) $\begin{array}{r} .0384 \\ +\ 21.969 \\ \hline \end{array}$

d) .39 + 14.863
e) .0175 + 21 + .063759
f) 23,000.58 + 469.10057

II. B. 2. 2. Evaluate these expressions

a) a + 3.5 if a = 4.9
b) x + .036 if x = 167.5
c) .05682 + y if y = .009349
d) 5,193.2703 + c if c = 45.6

II. C. (Review) CONTENT: Decimals; Subtraction

OBJECTIVE: The student will be able to

1. Find the difference between decimals.
2. Evaluate expressions involving subtraction.

II. C. 1. ACTIVITIES: 1. Subtract.

a) $\begin{array}{r} 3.024 \\ -\ 1.573 \\ \hline \end{array}$ b) $\begin{array}{r} 2.0332 \\ -\ .9542 \\ \hline \end{array}$ c) $\begin{array}{r} 66.5 \\ -\ 3.9284 \\ \hline \end{array}$

d) 20.00721 - .39215
e) 211 - 39.86
f) .467 - .00938

II. C. 2. 2. Evaluate these expressions.

a) 2.5 - a if a = 1.6
b) 3.41 - x if x = 2.38
c) c - 1.876 if c = 7.653
d) y - 3.459 if y = 10

II. D. (Review) CONTENT: Decimals; Multiplication

OBJECTIVE: The student will be able to

1. Multiply decimals.
2. Evaluate expressions involving multiplication.

II. D. 1. ACTIVITIES: 1. Multiply.

a) (2.4)(8.7)
b) (75.9)(0.372)
c) (8.1)(.0001)
d) (3.6782)(.001)

II. Decimals

II. D. 2. 2. Evaluate these expressions.

a) 5.03(a) if a = 6.1
b) b(.09) if b = 1.1
c) (9.0006)(c) if c = 3.01
d) (5.92)(0.47)
e) (0.0082)(6.6)

II. E. (Review) CONTENT: Decimals; Division

OBJECTIVE: The student will be able to

1. Divide decimals.
2. Evaluate expressions involving division.

II. E. 1. ACTIVITIES: 1. Divide.

a) $0.3\overline{).24}$ b) $8.7\overline{)20.88}$

c) $0.372\overline{)28.2348}$

d) $65.2 \div 1.63$
e) $0.0036 \div 1.2$
f) $57.8462 \div .002$

II. E. 2. 2. Evaluate each.

a) $1.69 \div x$ if $x = 1.3$
b) $3.6 \div c$ if $c = 0.09$
c) $93.702 \div a$ if $a = 2.4$
d) $h \div 2.5$ if $h = 37.595$
e) $m \div .007$ if $m = 0.56$
f) $1.245 \div y$ if $y = 5$

II. F. CONTENT: Decimals; Conversions

OBJECTIVE: *The student will be able to write decimals as

1. Fractions.
2. Mixed numbers.

II. F. 1. ACTIVITIES: 1. Write each decimal as a fraction that is reduced to lowest terms.

a) .8 c) .125
b) .5 d) .25

II. Decimals

II. F. 2. 2. Write each decimal as a mixed number that is reduced to lowest terms.

a) 3.4 c) 10.625
b) 2.75 d) 7.5

II. G. (Review) CONTENT: Decimals; Order of operations

OBJECTIVE: The student will perform multiple operations

1. Without grouping symbols.
2. With grouping symbols.

II. G. 1. ACTIVITIES: 1. Perform the indicated operations.

a) $5.7 + 3.2 \cdot (.07)$
b) $23.06 - (6.0075) \cdot (2)$
c) $18.5364 \div (8.13) \cdot (1.14)$
d) $26.11912 \div (2.003) \cdot (3.26) + 1.293 \div 3$
e) $34.404 + 9.0769 - 6.32458$

II. G. 2. 2. Perform the indicated operations.

a) $3.04 \cdot (6.2 - 3.5) + .1481$
b) $12 - (7.08 - 5.932)$
c) $20.88 \div [(2.4) \cdot (8.7)] + 6.1(.1435 \div 5)$
d) $2.01 [.313 (4.16 - 2.96) + 3.75 \div (.25 \cdot 7)]$
e) $48 \div (1.92 + 6.08) + .02 [.01 (.712 \cdot 3) + 1.5]$

II. H. (Review) CONTENT: Decimals; Ordering and comparing

OBJECTIVE: The student will be able to

1. Compare two decimals.
2. Order three or more decimals.

II. H. 1. ACTIVITIES: 1. Replace each blank with <, >, or = to make a true sentence.

a) 3.38 _____ 3.48
b) 4.2 _____ 4.18
c) 1.113 _____ 1.1041
d) 9,258.28 _____ 9,158.3
e) 345,168.174 _____ 345,168.1743

II. H. 2. 2. Write the decimals in order from least to greatest.

a) 6.07, 6.70, .67
b) .467, . 6, .4067
c) 6.3, 6.030, 6.29
d) 57.62, 37.72, 57.63, 57.61
e) 2134.9, 21.349, 213.49, 2.1349

II. Decimals

II. 1. CONTENT: *Decimals; Problem solving

OBJECTIVE: The student will be able to solve word problems involving the use of money.

ACTIVITIES: Solve the following.

a) Maria earned $32.75 and Juanita earned $42.60. How much more did Juanita earn than Maria?

b) Jane makes $5.35 an hour. How much would she earn in a forty hour week?

MEAT	
Hamburger	$1.79 lb.
Lamb Roast	1.95 lb.
Steak	3.49 lb.
Beef Liver	1.29 lb.
Polish Sausage	1.99 lb.

Directions: Use the table above to answer the questions below.

c) How much less per pound is lamb than steak?
d) If you bought a lamb roast for $5.97 and a pound of hamburger, how much change would you receive from a $10 bill?
e) Which costs less--two pounds of steak or three pounds of liver; a three-pound lamb roast or four pounds of hamburger?

III. Number Theory: Review and/or pretest material except where indicated by an asterisk.

III. A. CONTENT: Number theory; Divisibility tests

OBJECTIVE: The student will be able to recognize numbers that are (evenly) divisible by two, three, four, five, six, nine, ten, and eleven.

ACTIVITIES: Which of the following numbers are divisible:

a) by 2? (Rule: divisible by 2 if the ones digit is 0, 2, 4, 6, or 8.)

(1) 4,280 (2) 825 (3) 423

III. Number theory

III. A.

b) by 3? (Rule: divisible by 3 if the sum of the digits is divisible by 3.)

(1) 625 (2) 4,280 (3) 5,655

c) by 4? (Rule: divisible by 4 if the 2-digit number formed by its tens and ones digits is divisible by 4.)

(1) 825 (2) 1,008 (3) 5,655

d) by 5? (Rule: divisible by 5 if the ones digit is 0 or 5.)

(1) 1,008 (2) 129,456 (3) 625

e) by 6? (Rule: divisible by 6 if its ones digit is 0, 2, 4, 6, or 8 and the sum of its digits is divisible by 3.)

(1) 726 (2) 641 (3) 425

f) by 9? (Rule: divisible by 9 if the sum of the digits is divisible by 9.)

(1) 396 (2) 346 (3) 280

g) by 10? (Rule: divisible by 10 if the ones digit is 0.)

(1) 261 (2) 825 (3) 4,280

III. B. CONTENT: Number theory; Prime factors

OBJECTIVE: The student will be able to:

1. Define and identify prime and composite numbers.

2. Identify the factors and prime factors of a number.

3. Write a number as the product of its prime factors (17 or less).

III. Number theory

III. B. 1. ACTIVITIES: 1. Present a chart with the numbers 1 to 100, ten numbers per line. Have students do the following activity:

a) Cross out 1 since it is not a prime number.
b) Circle 2. Cross out all multiples of 2.
c) Circle 3. Cross out all multiples of 3.
d) Circle 5. Cross out all multiples of 5.
e) Continue until all numbers are either circled or crossed out.

The result is the identification of prime numbers (numbers greater than one with exactly two factors: 1 and the number itself) and composite numbers (any number that is not prime). [Sieve of Eratosthenes]

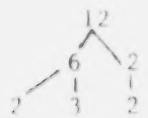
III. B. 2. 2. Write all the factors of each number given. Identify each factor as a prime or composite number.

a) 24
b) 52
c) 60
d) 36
e) 20
f) 18

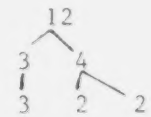
III. B. 3. 3. Show the students how to do factor trees. After an understanding is established of how factors are found, introduce the use of exponents in writing the prime factorization.

Factor the number 12 using the factor tree:

a)



b)



Finally, using exponents the end product is $12 = 2^2 \cdot 3$ using either factor tree.

Factor the number 12 using the "division by primes" method:

$$\begin{array}{r|l} 2 & 12 \\ 2 & 6 \\ 3 & 3 \\ \hline & 1 \end{array}$$

$12 = 2 \cdot 2 \cdot 3$
$12 = 2^2 \cdot 3$

III. Number theory

III. C. CONTENT: Number theory; Exponents

OBJECTIVES: The student will be able to:

1. Define and identify a base and an exponent.
*2. Write the exponential form of a power of ten given in standard form.
3. Extract the square root of a number that is a perfect square.
*4. Write the standard form of a number given in exponential form.
*5. Write a product of a variable as a power of that variable. Identify factored form and exponential form for each.

III. C. 1. ACTIVITIES: 1. Illustrate the terms with an example such as:

exponent

$(4)^3 = 4 \cdot 4 \cdot 4 = 64$

base factors

III. C. 2. 2. Extend understanding of the terms base and exponent using powers of ten such as

a) $100 = 10 \cdot 10 = 10^2$
b) $1000 = 10 \cdot 10 \cdot 10 = 10^3$
c) $10{,}000 = 10 \cdot 10 \cdot 10 \cdot 10 = 10^4$

III. C. 3. 3. If $x^2 = y$, then x is a square root of y. For instance, since $5^2 = 25$, 5 is the square root of $25 (5 = \sqrt{25})$.

a) Numbers 1-100 which are perfect squares are: 1, 4, 9, 16, 25,36, 49, 64, 81, and 100.

b) For a procedure for extracting a square root, see appendix.

III. C. 4. 4. Write the standard form of the numbers:

a) 3^4 b) 17^0 c) 8^1

III. C. 5. 5. Write each product as a power of the variable. Identify factored form and exponential form for each.

a) y·y b) n·n·n c) x·x·x·x

III. Number theory

III. D. CONTENT: Number theory; Greatest common factor (GCF)

OBJECTIVES: The student will use prime factors to determine the greatest common factor of two or more numbers.

III. D. 1. ACTIVITIES: 1. Several methods may be used

a) Write all the factors of each. Select the largest factor belonging to both.

36 and 54: 36 = 1, 2, 3, 4, 9, 18, 12, 36
54 = 1, 2, 3, 6, 9, 18, 27, 54
18 is the GCF.

b) 54 and 36 — Subtract the smaller from the larger until the answers are the same.

$$\begin{array}{rr} 54 & 36 \\ -36 & -18 \\ \hline 18 & 18 \end{array}$$

since 18 = 18

c) 54 and 36 — Divide smaller into larger. Difference becomes divisor. Divisor becomes dividend. Continue until difference is 0. Final divisor is GCF.

$$\begin{array}{r|l} & 1 \\ 36 & 54 \\ -36 & 2 \\ \hline 18 & 36 \\ & -36 \\ \hline & 0 \end{array}$$

d) Prime factorization method:

$36 = 2^2 \cdot 3^2$ $\qquad 2 \cdot 3^2 = 2 \cdot 9 = 18$

$54 = 2 \cdot 3^3$

1) Select the smallest power of the common prime factors.

2) Multiply their values.

III. E. CONTENT: Number theory: Least common multiple (LCM)

OBJECTIVE: The student will use prime factors to determine the least common multiple of two or more numbers.

III. Number theory

III. E. 1. ACTIVITIES: 1. Review the meaning of a multiple of a number, using a table such as given below.

9·1	9·2	9·3	9·4	9·5	9·6
9	18	27	36	45	54

a) Have students play the game, "I am a Multiple." Directions: One person is IT. Everyone else is a challenger. Whoever is IT chooses a secret number (for example, 15). Students must try to find out the number by asking questions in the form, "Are you a multiple of ...?" Only when a student is certain that he knows IT's number may he ask "Are you 15?" If correct, then he becomes IT. If he isn't correct, the person who is IT remains IT for the next game.

b) Have students list the multiples for each and then select the least common multiple (LCM) for each pair.

1) 6 and 8: 6, 12, 18, <u>24</u>, 30, etc.
8, 16, <u>24</u>, 32, etc.

2) 10 and 12: 10, 20, 30, 40, 50, <u>60</u>
12, 24, 36, 48, <u>60</u>

3) 9 and 12: 9, 18, 27, <u>36</u>, 45
12, 24, <u>36</u>, 48

c) Use prime factorization to find LCM:

$36 = 2^2 \cdot 3^2$ LCM $= 2^3 \cdot 3^2 \cdot 5 = 360$

$120 = 2^3 \cdot 3^1 \cdot 5^1$

1) Use the largest power of <u>each</u> prime factor.

2) Multiply.

III. Number theory

III. F. CONTENT: Number theory; Scientific notation

OBJECTIVE: The student will be able to:

*1. Express numbers in scientific notation.
*2. Interpret numbers given in scientific notation.

III. F. 1. ACTIVITIES: 1. Express each as a number in scientific notation.

a) 340
b) 5600
c) 12.7
d) 6,000,000
e) 847,000
f) 5.9

III. F. 2. 2. Express each as a number in standard form.

a) $2x10^4$
b) $3.4x10^6$
c) $5.8x10^2$
d) $4.32x10^1$
e) $6.1x10^5$
f) $8x10^9$

III. G. CONTENT: Number theory; Order of operations

OBJECTIVES: The student will perform multiple operations:

(1) With exponents and without grouping symbols:

(2) With exponents and with grouping symbols.

ACTIVITIES: "Please Excuse My Dear Aunt Sally" is an expression which may be helpful for students in remembering order of operations. The first letter in each word denotes the order: P = parenthesis, E = exponent, M = multiplication, D = division, A = addition, S = subtraction.

The correct order of operations is

P
E
M-D
A-S

III. Number theory

III. G. Note that multiplication and division occupy the same "level" and should be done in order from left to right as encountered in the expression being evaluated. Addition and subtraction also occupy the same "level" and follow the "left-to-right" rule.

Evaluate each expression.

III. G. 1. 1. Evaluate each.

a) $3 + 2^2 \cdot 5$
b) $88 \div 4 - 6 \cdot 2$
c) $4 + 3^2$
d) $6 + 8^2 \div 16 \cdot 2 - 4$

III. G. 2. 2. Evaluate each.

a) $(5^2 + 2)6 - 32 \div 8$
b) $10 + (8 - 6)^2 \cdot 4 \div 2$
c) $[(2^3+3)(8^2-4) \div 2] - 5 \cdot 2$

IV. Fractions: Review and/or pretest material except where indicated by an asterisk.

IV. A. (Review) CONTENT: Fractions; Renaming fractions

OBJECTIVE: The student will be able to rename a fraction in higher or lower terms.

ACTIVITIES: Complete to find an equivalent fraction.

a) $\frac{3}{7} = \frac{?}{14}$

b) $\frac{4}{5} = \frac{?}{35}$

c) $\frac{7}{9} = \frac{?}{63}$

d) $\frac{1}{14} = \frac{3}{?}$

e) $\frac{24}{36} = \frac{2}{?}$

f) $\frac{56}{64} = \frac{?}{8}$

IV. Fractions

IV. B. CONTENT: Fractions; Multiplication

OBJECTIVE: The student will be able to:

1. Multiply two fractions expressing the results in simplest terms.

2. Find the product of whole numbers, mixed numbers, and fractions.

*3. Multiply using the concept of cancellation.

IV. B. 1. and 3. ACTIVITIES: 1. and 3. Write the product in lowest terms.

a) $\frac{1}{3} \cdot \frac{1}{2}$

b) $\frac{3}{4} \cdot \frac{5}{7}$

c) $\frac{2}{3} \cdot \frac{9}{10}$

d) $\frac{8}{12} \cdot \frac{4}{6}$

IV. B. 2. and 3. 2. and 3. Write the product in lowest terms.

a) $\frac{3}{5} \cdot 15$

b) $2\frac{3}{4} \cdot \frac{4}{5}$

c) $1\frac{2}{3} \cdot 3\frac{1}{5}$

d) $6\frac{1}{2} \cdot 3$

e) $\frac{15}{19} \cdot 3\frac{1}{6}$

IV. C. (Review) CONTENT: Fractions; Division

OBJECTIVE: The student will be able to:

1. Identify the multiplicative inverse (reciprocal) of a fraction.

IV. Fractions

2. Divide a fraction by a fraction, expressing the quotient in simplest form.

3. Find the quotient of whole numbers, mixed numbers and/or fractions, expressing results in simplest form.

IV. C. 1. ACTIVITIES: 1. Write the multiplicative inverse (reciprocal) of each.

a) 4 c) $\frac{3}{2}$ e) a g) $\frac{b}{a}$

b) $\frac{1}{3}$ d) $\frac{1}{9}$ f) $\frac{1}{c}$ h) $\frac{3m}{8}$

IV. C. 2. 2. Divide and express answers in simplest form.

a) $\frac{2}{3} \div \frac{1}{5}$

b) $\frac{1}{4} \div \frac{3}{8}$

c) $\frac{2}{5} \div \frac{3}{4}$

d) $\frac{3}{5} \div \frac{6}{15}$

IV. C. 3. 3. Divide and express answers in simplest form.

a) $\frac{1}{5} \div 4$

b) $\frac{3}{12} \div \frac{6}{36}$

c) $2 \div \frac{3}{4}$

d) $3\frac{1}{2} \div 4\frac{6}{8}$

e) $1\frac{7}{9} \div 18$

IV. Fractions

IV. D. (Review) CONTENT: Fractions; Addition

OBJECTIVE: The student will be able to:

1. Add two fractions or mixed numbers with like denominators (no simplifying).
2. Add two fractions with like denominators, expressing results in simplest form.
3. Add two fractions with unlike denominators, expressing results in simplest form.
4. Find the sum of whole numbers, fractions, and/or mixed numbers with like or unlike denominators, expressing results in simplest form.

IV. D. 1. ACTIVITIES:

1. Solve each of the following.

a) $\frac{7}{9} + \frac{1}{9}$

b) $\frac{3}{8} + \frac{4}{8}$

c) $\frac{9}{17} + \frac{4}{17}$

d) $5\frac{1}{3} + 9\frac{1}{3}$

e) $4\frac{3}{5} + \frac{1}{5}$

f) $5\frac{1}{7} + 2\frac{3}{7}$

IV. D. 2.

2. Solve each of the following:

a) $\frac{9}{15} + \frac{1}{15}$

b) $\frac{3}{16} + \frac{5}{16}$

c) $\frac{13}{20} + \frac{7}{20}$

d) $\frac{6}{25} + \frac{9}{25}$

IV. Fractions

IV. D. 3. 3. Write the sum in lowest terms.

a) $\frac{2}{7} + \frac{2}{14}$

b) $\frac{5}{6} + \frac{2}{3}$

c) $\frac{3}{10} + \frac{5}{6}$

IV. D. 4. 4. Write the sum in lowest terms.

a) $\frac{5}{7} + \frac{11}{14}$

b) $9 + \frac{6}{11}$

c) $7\frac{1}{3} + 6$

d) $2\frac{5}{8} + 3\frac{11}{24}$

IV. E. (Review)

CONTENT: Fractions; Subtraction

OBJECTIVE: The student will be able to:

1. Subtract fractions or mixed numbers with like denominators, expressing results in simplest form.

2. Subtract fractions or mixed numbers with unlike denominators, expressing results in simplest form.

3. Find the difference between whole numbers, mixed numbers, or fractions with or without like denominators, expressing the results in simplest form.

IV. Fractions

IV. E. 1. ACTIVITIES: 1. Write the difference in lowest terms.

a) $\frac{7}{6} - \frac{5}{6}$

b) $\frac{7}{10} - \frac{3}{10}$

c) $5\frac{4}{15} - 2\frac{1}{15}$

d) $6\frac{1}{8} - \frac{3}{8}$

e) $6\frac{1}{3} - 4\frac{2}{3}$

IV. E. 2. and 3. 2. and 3. Write the difference in lowest terms.

a) $\frac{7}{8} - \frac{3}{24}$

b) $\frac{5}{6} - \frac{7}{30}$

c) $\frac{4}{7} - \frac{3}{14}$

d) $5 - 3\frac{1}{3}$

e) $8\frac{1}{5} - 6$

f) $8\frac{5}{18} - 6\frac{7}{12}$

IV. F. (Review) CONTENT: Fractions; Order of operations

OBJECTIVE: The student will be able to:

1. Perform multiple operations without grouping symbols.

2. Perform multiple operations with grouping symbols.

IV. Fractions

IV. F. 1. and 2. ACTIVITIES: 1. and 2. Perform the indicated operations.

a) $\frac{1}{2} \cdot \frac{4}{5} + \frac{7}{8} \div 2\frac{1}{2} - \frac{1}{4}$

b) $\frac{3}{8} \cdot \frac{2}{3} + 1\frac{1}{2} - \frac{3}{4} \div \frac{3}{5}$

c) $\frac{1}{2}\left[\frac{3}{4}\left(\frac{1}{3} + \frac{1}{2}\right) - \frac{3}{8}\right]$

d) $5\left[\left(4\frac{2}{3} + \frac{1}{5}\right) - \left(\frac{1}{15} + \frac{3}{5}\right)\right]$

e) $\frac{4}{5} \cdot \frac{5}{6} + \frac{3}{8} \div \frac{1}{4} - \frac{1}{8}$

f) $\frac{3}{4} \cdot \frac{2}{9} + 2\frac{1}{2} - \frac{1}{4} \div \frac{3}{5}$

g) $\frac{1}{4}\left[\frac{2}{3}\left(\frac{1}{3} + \frac{1}{2}\right) - \frac{4}{9}\right]$

h) $3\left[\left(4\frac{3}{4} + \frac{1}{2}\right)\left(\frac{1}{2}\right) - \frac{3}{8}\right]$

IV. G. (Review) CONTENT: Fractions; Fractional conversion

OBJECTIVE: The student will be able to:

1. Change common fractions to decimals.
2. Change mixed numbers to decimals.

IV. G. 1. and 2. ACTIVITIES: 1. and 2. Write the fraction or mixed numeral as a terminating or repeating decimal.

a) $\frac{3}{5}$

b) $\frac{7}{10}$

c) $\frac{12}{25}$

d) $\frac{7}{9}$

e) $\frac{11}{12}$

f) $1\frac{5}{8}$

g) $\frac{5}{4}$

h) $\frac{32}{10}$

i) $2\frac{8}{9}$

j) $\frac{65}{40}$

IV. Fractions

IV. H. (Review) CONTENT: Fractions; Ordering and comparing

OBJECTIVE: The student will be able to:

1. Determine the greater or lesser by comparing two fractions.

2. Determine the correct order of a set of fractions.

IV. H. 1. ACTIVITIES: 1. Replace each __ with >, <, or = to make a true statement.

a) $\frac{2}{3}$ __ $\frac{3}{4}$ d) $\frac{16}{40}$ __ $\frac{2}{5}$ g) $\frac{9}{25}$ __ $\frac{4}{50}$

b) $\frac{5}{12}$ __ $\frac{10}{24}$ e) $\frac{11}{13}$ __ $\frac{33}{39}$ h) $\frac{14}{48}$ __ $\frac{7}{24}$

c) $\frac{8}{15}$ __ $\frac{3}{5}$ f) $\frac{25}{30}$ __ $\frac{5}{7}$ i) $\frac{4}{5}$ __ $\frac{4}{6}$

IV. H. 2. 2. Write the fractions in order from least to greatest.

a) $\frac{2}{3}$, $\frac{3}{5}$, $\frac{1}{2}$

b) $\frac{13}{24}$, $\frac{3}{8}$, $\frac{5}{12}$, $\frac{1}{2}$

c) $\frac{13}{21}$, $\frac{17}{42}$, $\frac{5}{6}$, $\frac{2}{3}$, $\frac{4}{7}$

d) $\frac{1}{4}$, $\frac{5}{28}$, $\frac{2}{7}$

e) $\frac{8}{9}$, $\frac{5}{6}$, $\frac{13}{18}$, $\frac{2}{3}$

f) $\frac{17}{30}$, $\frac{5}{6}$, $\frac{4}{5}$, $\frac{9}{10}$, $\frac{2}{3}$

IV. I. CONTENT: Fractions; Problem solving

OBJECTIVE: *The student will be able to solve word problems involving money.

a) A gas tank holds 12 gallons of gasoline. The pump registered 9½ gallons at a cost of 77 9/10 cents per gallon. How much did the gasoline cost?

IV. Fractions

IV. I.

b) Fabric sells for $18 per yard. Maria needs 5 3/4 yards. What is the price of the fabric?

c) City Cab charges $2 per mile. Jean rides 4 3/4 miles in a cab. How much does she owe the cab driver?

V. Ratio, Proportion, Percent

V. A. CONTENT: Ratio, proportion, percent; Ratio

OBJECTIVE: The student will be able to write ratios as fractions.

ACTIVITIES: Change each of the following ratios to a fraction.

a) 3 to 5
b) 10 out of 25 rides
c) 2:12
d) eleven out of twenty-one free throws

V. B. CONTENT: Ratio, proportion, percent; Proportion

OBJECTIVE: The student will be able to:

*1. Identify equivalent ratios as proportions.

2. Define and identify the parts (terms) of a proportion (means and extremes).

3. Solve for the missing term of a proportion.

V. B. 1. ACTIVITIES: 1. Identify each as a proportion or not a proportion.

a) $\frac{1}{2} = \frac{3}{6}$ c) $\frac{3}{5} = \frac{5}{3}$

b) $\frac{9}{12} = \frac{12}{16}$ d) $\frac{3}{6} = \frac{4}{10}$

V. Ratio, proportion, percent

V. B. 2. 2. Identify the means and extremes of the following.

a) $\frac{2}{4} = \frac{3}{6}$ b) $\frac{6}{8} = \frac{16}{24}$

V. B. 3. 3. Solve for the missing term.

a) $\frac{1}{2} = \frac{x}{16}$

b) $\frac{5}{x} = \frac{20}{16}$

V. C. 1. CONTENT: Ratio, proportion, percent; Percent

OBJECTIVE: The student will be able to

*1. Change proper and improper fractions or mixed numbers to percents.

2. Change a percent to a decimal number.

3. Change a percent to a fraction in lowest terms.

*4. Find the percent of increase or decrease.

*5. Use percentages less than one percent.

*6. Distinguish between simple and compound interest.

*7. Define straight salary and commission.

V. C. 1. ACTIVITIES: 1. Write as a percent.

a) $\frac{25}{100}$

b) $\frac{1}{5}$

c) $\frac{2}{3}$

d) $\frac{3}{2}$

e) $2\frac{1}{2}$

V. Ratio, proportion, percent

V. C. 2. 2. Write as a decimal.

a) 75%
b) 52%
c) 0.403%

V. C. 3. 3. Write as a fraction in lowest terms.

a) 60%
b) 53%
c) 44%

V. C. 4. 4. Find the percent of increase or decrease.

a) from 25 to 40
b) from 40 to 25
c) from 100 to 112
d) from 200 to 90
e) from 90 to 200

V. C. 5. 5. Write as a percent.

a) 0.008
b) 0.0025
c) Fill in the blank.

(1) .5% of 25 = _____
(2) _____ % of 25 = .125
(3) .5% of _____ = .125

V. C. 6. 6. Define simple interest and compound interest.

V. C. 7. *7. Define each.

a) Straight salary.

b) Commission.

V. D. CONTENT: Ratio, proportion, percent; Problem solving

OBJECTIVE: *The student will solve appropriate word problems

*1. Involving simple interest.
*2. The computation of price and sale price, tax, discount, and rate of discount.

V. Ratio, proportion, percent

V. D. 1. ACTIVITIES: 1. Solve each.

a) What is the interest on $8000 at 5% for 2 years?

b) What is the interest on $350 at 6% for 5 years?

V. D. 2. 2. Solve each.

a) Jim bought a sweater for $26.95, a shirt for $12.45, and a pair of jeans for $19.98. What is his total price for the articles he bought?

b) In the problem above, if the tax rate is 5%, how much tax will Jim owe?

c) A sweater marked $20.00 is on sale for 20% off. What is the amount of discount?

d) Jane bought a pair of jeans for $15 that were regularly sold for $20. What was the rate of discount?

VI. Integers, Rational Numbers, and Real Numbers

VI. A. CONTENT: Integers, rational numbers, and real numbers; Definitions

OBJECTIVE: The student will be able to define and identify integers, rational numbers, irrational numbers, and real numbers.

ACTIVITIES: Define and identify each of the following as:

(1) Natural numbers
(2) Whole numbers
(3) Integers
(4) Rational numbers
(5) Irrational numbers
(6) Real numbers

Each item may have multiple answers.

a) 0

b) -1.2

c) $\frac{3}{4}$

d) $\sqrt{16}$

e) $\sqrt{3}$

f) π

g) 125

h) $\frac{2}{3}$

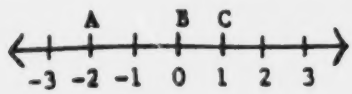
VI. Integers, rational numbers, and real numbers

VI. B. CONTENT: Number line; Construction

OBJECTIVES: The student will be able to construct a number line and

1. Identify the coordinate of a point.
2. Plot a designated point.

VI. B. 1. ACTIVITIES: 1. Identify the coordinate of each.



a) b) c)

VI. B. 2. 2. Plot each of the following points on a number line.

a) -2
b) 0
c) $\sqrt{9}$

VI. C. CONTENT: Subsets of the real numbers

OBJECTIVE: The student will be able to diagram the subsets of the real number system.

VI. C. ACTIVITIES: See appendix for example.

VI. D. CONTENT: Number line; Graphs of subsets

OBJECTIVE: The student will graph various subsets of real numbers.

ACTIVITIES: Graph each.

a) $x > 2$
b) $x \leq -1$
c) $x \neq 4$

VI. Integers, rational numbers, and real numbers

VI. E. CONTENT: Number line; Absolute value

OBJECTIVE: The student will define and determine the absolute value of a real number.

ACTIVITIES: a) Define the absolute value of a real number.

b) Find the absolute value of the following real numbers.

(1) $|2|$ (3) $|-4|$

(2) $|0|$ (4) $|\frac{1}{2}|$

VI. F. CONTENT: Integers, rational numbers, and real numbers; Operations

OBJECTIVE: The student should be able to perform the operations of addition, subtraction, multiplication, and division of:

1. Integers
2. Rational numbers
3. Real numbers

VI. F. 1. ACTIVITIES: 1. Perform the indicated operation.

a) $3 + 2$
b) $-5 + 4$
c) $8 + (-6)$
d) $-1 + (-7)$
e) $6 - 4$
f) $-8-3$
g) $5-(-6)$
h) $-7-(-9)$
i) $5 \cdot 6$
j) $(-3) \cdot 7$
k) $6 \cdot (-9)$
l) $(-4)(-8)$
m) $12 \div 4$
n) $-16 \div 8$
o) $24 \div (-3)$
p) $-50 \div (-10)$

VI. Integers, rational numbers, and real numbers

VI. F. 2. 2. Perform the indicated operation.

a) $\frac{3}{4} + \frac{1}{2}$

b) $-\frac{3}{8} + \frac{2}{3}$

c) $5\frac{1}{3} + (-2\frac{1}{2})$

d) $-11 + (-4\frac{5}{6})$

e) $\frac{5}{6} - \frac{2}{3}$

f) $-\frac{4}{9} - \frac{1}{6}$

g) $4\frac{2}{5} - (-1\frac{3}{4})$

h) $-6 - (-2\frac{1}{2})$

i) $\frac{3}{8} \cdot \frac{4}{9}$

j) $(-\frac{2}{7}) \cdot \frac{5}{6}$

k) $(2\frac{1}{2}) \cdot (-\frac{2}{5})$

l) $(-4) \cdot (-\frac{3}{8})$

m) $\frac{2}{5} \div \frac{3}{10}$

n) $(-\frac{3}{4}) \div (\frac{1}{2})$

o) $\frac{2}{9} \div (-1\frac{1}{3})$

p) $(-\frac{4}{5}) \div (-4)$

q) $2.6 + 13.45$

r) $-0.179 + 3.92$

s) $2.356 + (-15.6)$

t) $-1.4 + (-16.38)$

u) $3.9 - 2.47$

v) $-0.38 - 1.4$

w) $35.6 - (-2.75)$

x) $-8 - (-4.2)$

y) $(3.7)(4.03)$

z) $(-0.03)(2.7)$

aa) $(3.5)(-0.02)$

bb) $(-6.95)(-0.005)$

cc) $2 \div 0.05$

dd) $(-6.32) \div 0.4$

ee) $16.23 \div (-0.03)$

ff) $(-2.6) \div (-0.005)$

VI. F. 3. 3. For activities for real numbers, use a mixture of activities 1. and 2. above.

VI. Integers, rational numbers, and real numbers

VI. G. CONTENT: Integers, rational numbers, and real numbers; Order of operations

OBJECTIVE: The student will be able to perform multiple operations on real numbers with or without grouping symbols.

ACTIVITIES: Perform the indicated operations.

a) $(3^2 - \frac{2}{3} \cdot 1\frac{1}{2}) \div (-2) + 8.6$

b) $16 \div (-\frac{1}{2}) - (4.2)(5) + 13.9$

VI. H. CONTENT: Integers, rational numbers, and real numbers; Properties

OBJECTIVE: The student will be able to recognize and use:

1. Closure properties
2. Commutative properties
3. Associative properties
4. Additive identity properties
5. Multiplicative identity properties
6. Additive inverse
7. Multiplicative inverse
8. Distributive property
9. Multiplicative property of 0

ACTIVITIES: Fill in the blank with the letter of the best choice. Each property is dealing with the set of numbers. Each variable represents a real number.

1. Closure under addition
2. Closure under multiplication
3. Commutative property of addition
4. Commutative property of multiplication
5. Associative property of addition
6. Associative property of multiplication
7. Additive identity properties
8. Multiplicative identity properties
9. Additive inverse
10. Multiplicative inverse
11. Distributive property of multiplication over addition
12. Multiplicative property of 0

a) $2xy \cdot 1 = 2xy$

b) $-5 \cdot (-\frac{1}{5}) = 1$

c) $(3+5)+8 = 3+(5+8)$

d) $6 + 3.8$ is a real number

e) $3(a+b) = 3a + 3b$

f) $5+a = a+5$

g) $(-3)(0) = 0$

h) $(4 \cdot x) \cdot (-3) = 4 \cdot [x \cdot (-3)]$

i) $4 \cdot \sqrt{3}$ is a real number

j) $6 + (-6) = 0$

k) $(-\frac{4}{5})(r) = (r)(-\frac{4}{5})$

l) $.3x^2y + 0 = .3x^2y$

VI. Integers, rational numbers, and real numbers

VI. I. CONTENT: Integers, rational numbers, and real numbers; Problem solving

OBJECTIVE: The student will be able to solve appropriate word problems involving the use of operations with real numbers.

ACTIVITIES: Use positive and negative real numbers to represent each situation. Then perform the indicated operation.

a) Three penalties of 5 yards each
b) Six times a debt of $10.60
c) Three and one-half yards of fabric at $2.75 per yard

VII. Elementary Algebra

VII. A. CONTENT: Elementary algebra; Evaluate expressions

OBJECTIVE: The student will be able to evaluate an algebraic expression given a replacement set for the variable(s), using the property of substitution.

VII. A. 1. ACTIVITIES: 1. Evaluate for the given values of the variables.

a) $30 + 2t$ for $t = 10$

b) $\frac{2(b+3)}{8}$ for $b = 9$

c) $2a + b$ for $a = 7$ and $b = 5$

d) $\frac{c \cdot c \cdot c}{a \cdot a}$ for $a = 3$ and $c = 9$

e) $\frac{3}{4} z + \frac{5}{7} t$, for $z = 16$ and $t = 35$

f) $\frac{3}{w-v}$ for $w = 10$ and $v = 4$

g) $4.6u - 0.7p$ for $u = .2$ and $p = 3$

VII. A. 2. 2. Find B for each formula.
The replacement set for n is {8, 10, 12}

a) $B = \frac{n}{3} + \frac{2}{3} n$

b) $B = 5n$

c) $B = \frac{4+n}{2}$

d) $B = 3n - \frac{2}{3}$

e) $B = 2n(7+n)$

VII. Elementary algebra

VII. B. CONTENT: Operations on polynomials

OBJECTIVE: The student will be able to:

1. a) Define the term monomial.
   b) Define and identify like terms.
   c) Define binomial, trinomial, and polynomial.
   d) Add and subtract polynomials.
2. Multiply two or more monomials
3. Multiply a polynomial by a monomial (Distributive property).
4. Divide a monomial by a monomial.

VII. B. 1. ACTIVITIES: a), b), c), d)

1. a), b), c), d). Matching:

(a)	term	_____(1)	terms having the same variables. Corresponding variables have the same exponent.
(b)	monomial		
(c)	binomial		
(d)	trinomial		
(e)	polynomial		
(f)	"like terms"	_____(2)	a polynomial with three terms.
		_____(3)	a term that is the product of numbers and variables with positive exponents.
		_____(4)	a real number, a variable, or the product of a real number and a variable.
		_____(5)	a monomial or the sum of monomials.
		_____(6)	sum or difference of two monomials.

VII. B. 1. ACTIVITIES: b), c)

1. b), c) Identify the following pairs of terms as like or unlike.

(1)	$4x$ and $7x$	(6)	$11a^2b$ and $9a^2b$
(2)	$-3t$ and $-3t^2$	(7)	-2 and $-2a$
(3)	$5a$ and $-6a$	(8)	x^2y^4 and $6x^2y^4$
(4)	$2st$ and s^2t	(9)	$7ab^2$ and $2a^2b$
(5)	$-6y$ and $4.2y$	(10)	4 and 26

VII. B. 1. ACTIVITIES: d)

1. d) Add and subtract as indicated. Combine like terms:

(1)	$6x + 2x$	(6)	$-7.6y^2 + 2.3y^2$
(2)	$3mn + 5mn$	(7)	$7x-3y + 2x - x+4y + 6x$
(3)	$7a^2b + 13a^2b$	(8)	$3c - 2\frac{1}{2}f + 5\frac{1}{4}c - 6\frac{1}{4}c$
(4)	$2m + (-7m)$	(9)	$3x^2 - 4x + 6 + 4x - 3 + x^2$
(5)	$-5m - (-7m)$	(10)	$bx + 2b^2x - 7bx + 6 - b^2x$

VII. Elementary algebra

VII. B. 1. d)

Add

(11) $\begin{array}{r} 2x + 5y \\ 4x + y \end{array}$ (12) $\begin{array}{r} 2a - 6b \\ 7a + 3b \end{array}$ (13) $\begin{array}{r} x^2 - 33x + 15 \\ -4x^2 + 18x - 36 \end{array}$

Add/Subtract (apply rules for operations on fractions)

(14) $\frac{a}{c} + \frac{b}{c}$ (18) $\frac{a}{b} + \frac{c}{d}$ (22) $\frac{c}{3} - \frac{c}{9}$

(15) $\frac{2a}{5} + \frac{3a}{5}$ (19) $\frac{2c}{3} + \frac{5c}{9}$ (23) $\frac{2r}{5} - \frac{r}{10}$

(16) $\frac{5}{a} + \frac{4}{a}$ (20) $\frac{9}{b} - \frac{3}{b}$ (24) $c - \frac{c}{2}$

(17) $\frac{7}{15a} + \frac{4}{15a}$ (21) $\frac{3a}{n} - \frac{2a}{n}$ (25) $\frac{3c}{4} - \frac{4c}{9}$

VII. B. 2. ACTIVITIES: 2. Multiply two or more monomials.

1) $3(2b)$
2) $(-5c)(7c)$
3) $(2x)(-4y)$
4) $(3t)(t^2)$
5) $(3a)(2b)(-10c)$
6) $(-3)(-y^4)(-u^2)$
7) $(-9c)(8cd^2)$
8) $(2r^2s^3)(3r^3s^2)(-r^5s)$
9) $(7x)(-2t)(4z)$
10) $(12b)(-\frac{1}{2}c)$

Multiply (apply rules for multiplying fractions).

11) $\frac{1}{a} \cdot 8$
12) $\frac{7}{13} \cdot n$
13) $3\frac{1}{7} \cdot \frac{m}{3}$
14) $\frac{c}{2} \cdot 1\frac{2}{3}$
15) $\frac{2}{3m} \cdot 3\frac{2}{5}$
16) $\frac{1}{a} \cdot \frac{2}{3}$
17) $\frac{1}{6} \cdot \frac{6}{3}$
18) $\frac{2}{a} \cdot \frac{a}{8}$
19) $\frac{5}{d} \cdot \frac{2d}{15}$
20) $\frac{3a}{4} \cdot \frac{5b}{6}$

VII. Elementary algebra

VII. B. 3. 3. Multiply a polynomial by a monomial (Distributive Property).

1) $3(4c + 2d)$
2) $10(2b - \frac{1}{5} f)$
3) $4x(-2x + 5)$
4) $-6c(3c - 2c^2)$
5) $mn(m + n)$
6) $3d(d^2 - 2d + 4)$
7) $-2(4a + 7b)$
8) $-7a^2b(-2ab + 2ab^2)$
9) $\frac{3}{4} (8f + 12g)$
10) $-9e(4 - 2e - 6e^2)$

VII. B. ACTIVITIES: 4. Divide a monomial by a monomial.

1) $x^6 \div x^3$
2) $t^{12} \div t^4$
3) $\frac{e^9}{e^4}$
4) $\frac{z^6}{z^6}$
5) $3^4 \div 3$
6) $n^{10} \div n^8$
7) $2^5 \div 2^2$
8) $x^{5a} \div x^{2a}$
9) $\frac{s^x}{s^2}$
10) $\frac{-35x^b}{7x^3}$

Divide (apply rules for dividing fractions).

11) $\frac{d}{5} \div d$
12) $\frac{2}{m} \div 6$
13) $2\frac{1}{8} \div \frac{c}{8}$
14) $5\frac{1}{2} \div \frac{2}{3c}$
15) $4\frac{1}{6} \div \frac{m}{s}$
16) $\frac{1}{a} \div \frac{1}{6}$
17) $\frac{8a}{12} \div \frac{4}{6a}$
18) $\frac{c}{3} \div \frac{5c}{9}$
19) $\frac{6a^2}{54} \div \frac{3a}{9}$
20) $\frac{3w}{c} \div \frac{6w}{5c}$
21) $\frac{12a^6b^6c^6}{3a^4b^2c}$

VII. Elementary algebra

VII. C. ACTIVITIES: C. GCF, LCM

VII. C. 1. 1. The general method for determination of the GCF using monomials is as follows:

Example:

a) Factor each expression.

b) Write all the factors which are common and use the smallest power of each.

$25a^2b = 5^2 \cdot a^2 \cdot b$
$10a^3 = 2 \cdot 5 \cdot a^3$
$15a^2 = 3 \cdot 5 \cdot a^2$
$GCF = 5 \cdot a^2 = 5a^2$

VII. C. 2. 2. Find the LCM. Write all of the factors. Use the largest power of each.

Example: $5a^2b = 5a^2b$
$10abc = 2 \cdot 5abc$
$25ab^2c^3 = 5^2ab^2c^3$
LCM: $2 \cdot 5^2a^2b^2c^3 = 50a^2b^2c^3$

a) $36x^2yz^3 = 2^2 \cdot 3^2x^2yz^3$
$27x^2y^3z = 3^3 \cdot x^2y^3$
LCM: $2^2 \cdot 3^3 \cdot x^2y^3z^3 = 108x^2y^3z^3$

VIII. Linear Equations and Inequalities of One Variable

VIII. A. CONTENT: Linear equations; Properties of equality

OBJECTIVE: The student will use the axioms of equality.

ACTIVITIES: Identify each of the following as reflexive (a=a), symmetric (if a=b, then b=a), or transitive (if a=b and b=c, then a=c).

a) $3 = 3$
b) If $a = b$ and $b = 5$, then $a = 5$
c) If $5 = x$, then $x = 5$
d) If $m = 2 + 5$ and $2 + 5 = 7$, then $m = 7$
e) $-\frac{2}{5} = -\frac{2}{5}$
f) If $2 \cdot 6 = 12$, then $12 = 2 \cdot 6$

VIII. Linear equations and inequalities of one variable

VIII. B. CONTENT: Linear equations; Solution of linear equations in one variable.

OBJECTIVE: The student will be able to solve equations

1. Involving only one operation.
2. Involving more than one operation.
3. Having variables on both sides.

VIII. B. ACTIVITIES: 1., 2., and 3.

Solve.

1. a) $x + 2 = 5$
   b) $y + 6 = -11$
   c) $m + 12 = 20$
   d) $a - 3 = 4$
   e) $n - 6 = -9$
   f) $p - 15 = 32$
   g) $3q = 24$
   h) $-4n = 28$
   i) $\frac{2}{3} c = -18$
   j) $\frac{a}{12} = 2$
   k) $\frac{w}{3} = 6$
   l) $\frac{r}{6} = -42$
2. m) $3x + 2 = 17$
   n) $2 = 8 - 6y$
   o) $\frac{3}{4} a + 4 = 22$
   p) $5m - 8m = -12$
3. q) $12d-5 = 8d+3$
   r) $5y+12 = -15-4y$
   s) $-6b+14 = 2b+6$
   t) $4d = 8d+20$

VIII. C. CONTENT: Linear equations; Graphing

OBJECTIVE: The student will be able to use a rectangular coordinate system to

1. Locate and relate points in the plane to ordered pairs of numbers.
2. Graph linear equations in two variables.

VIII. C. ACTIVITIES: 1.

1. Graph each ordered pair.

   a) (-3,0)
   b) (-2,3)
   c) (5,0)
   d) (1,4)
   e) (0,-3)
   f) (0,2)
   g) (4,-2)
   h) (-2,-1)
   i) (0,0)

   Does the point lie in a quadrant or on an axis? Which quadrant or which axis?

VIII. Linear equations and inequalities of one variable

VIII. C. 2. 2. Draw a coordinate system and graph.

a) $2x + y = 4$
b) $3x - 2y = -6$
c) $-5y = -x + 10$
d) $y = -2$
e) $x = 3$

VIII. D. CONTENT: Linear equations; Problem solving

OBJECTIVE: The student will be able to

1. Translate verbal expressions to algebraic expressions and vice versa.
2. Use linear equations to solve word problems involving number relations such as number, consecutive integer, geometry, distance, coin, and age problems.

VIII. D. 1. ACTIVITIES: 1. Translate each word phrase into an algebraic expression.

a) (1) The sum of b and 8
(2) x decreased by y
(3) The product of m and n
(4) 12 increased by 8
(5) 5 less than t
(6) 3 more than twice c
(7) 6 less than four times m
(8) Seven diminished by the sum of 2 and x
(9) Five times the sum of 2 and y
(10) The square of the product of 3 and x
(11) The square of the sum of 3 and x

b) Translate each algebraic expression into words.

(1) $5 + n$
(2) $3 - x$
(3) $(a+b)$
(4) $5p - 3$

VIII. D. 2. 2. a) Number problems

(1) The sum of twice a number and 16 is 86. Find the number.
(2) Seventeen less than three times a number is 43. What is the number?

b) Consecutive integer problems

(1) The sum of two consecutive integers is 35. What are the integers?

(2) The sum of three consecutive odd integers is 105. Find the integers.
(3) Find three consecutive even integers such that four times the greatest decreased by five times the least is 26.

VIII. D. 2.

c) Geometry problems

(1) The length of a rectangle is 3cm more than twice the width. If the perimeter of the rectangle is 30cm, find the dimensions of the rectangle.
(2) The perimeter of a triangle is 22m. The length of one side of the triangle is three more than twice the length of the first side. The third side is two less than four times the first side. Find the length of each side.

d) Distance problems

(1) Two trains leave the same station at the same time and travel in opposite directions. If their rates are 50 mi/hr and 60 mi/hr, in how many hours will they be 660 miles apart?
(2) A salesman made a 375 mile trip by traveling 3 hours by bus and 4 hours by train. The train's average speed was 15 mi/hr more than the average speed of the bus. Find the rates of each.

e) Coin problems

(1) Hilda has $2.15 in dimes and quarters. If she has four more dimes than quarters, how many dimes does she have?
(2) A soft drink machine takes nickels, dimes, and quarters. If a week's receipts of $21.30 contains 17 more dimes than quarters and 24 fewer nickels than quarters, how many nickels did the machine contain?

VIII. Linear equations and inequalities of one variable

f) Age problems

(1) Bob is 3 years more than twice as old as Emma. If the sum of their ages is 39, what is the age of each?
(2) Jack's father is 4 times as old as Jack is now. In 5 years, he will be 3 times as old as Jack will be then. How old is Jack now?

VIII. E. CONTENT: Solutions of inequalities in one variable.

OBJECTIVE: The student will be able to:

1. Find the solution set of a linear inequality in one variable.

2. Graph the solution set of a linear inequality in one variable.

ACTIVITY: Solve and graph these inequalities.

(1) $x + 2 \geq 5$
(2) $x + 2 > 5$
(3) $x - 3 < 16$
(4) $x - 7 > -2$
(5) $x + 7 \leq -1$
(6) $2x \leq 10$
(7) $6x > -24$
(8) $-8x < 32$
(9) $-5x \geq -20$
(10) $2x \geq 7$
(11) $2x + 3 \geq 8$
(12) $4x - 1 \leq 13$
(13) $x + \frac{1}{2} < 7$
(14) $x - \frac{1}{4} > -3$
(15) $3x + \frac{3}{4} < -6\frac{1}{4}$

IX. Probability and Statistics

IX. A. CONTENT: Probability and statistics; Graphs

OBJECTIVE: The student will be able to:

1. Interpret information presented in maps, charts, and tables.
2. Construct, interpret and use data from pictographs, bar graphs, circle graphs and line graphs.

IX. A. 1. and 2. ACTIVITIES: 1. and 2. a) Use the table below to answer the questions.

Job Opportunities in the Twenty-first Century	
JOB	Number of Persons Needed
Robot Technicians	4,750,000
Disease Researchers	3,465,000
Stress Consultants	2,750,000
Physical Fitness Experts	5,000,400

(1) What is the total number of job opportunities listed in the chart?

(2) What percentage of the total number of job opportunities is the number of persons needed for robot technicians?

IX. Probability and statistics

IX. A. 1. and 2.

b) Use the data in the tables below to construct:

(1) A bar graph showing the number of hours spent studying various subjects each week.

Subject	Hours Spent
Algebra I	5
Biology	3½
Civics	2
English I	4
French I	2½

(2) A pictograph.

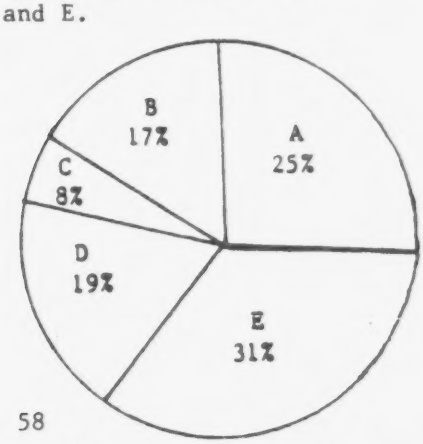
PROJECTED NUMBER
OF CAR SALES IN 1995

Kind of Car	Projected Sales
Isuzu	435,000
BMW	150,000
Peugeot	340,000
Ford Escort	260,000
Yugo	380,000

(3) A double line graph showing the number of students enrolled in two different schools.

Grade	Vo Tech	Magnet High
9	400	350
10	360	400
11	320	430
12	280	360

c) Use the circle graph below to answer the following questions about items A, B, C, D, and E.



Total Sales
1000 items

IX. Probability and statistics

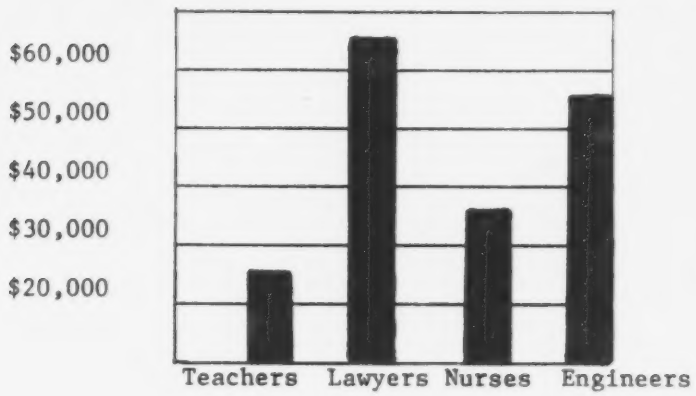
IX. A. 1. and 2.

c) (1) What percent of items A and C were sold?

(2) The sale of items C and D exceeded the sale of item A by what percent?

(3) The total number of sales for item E was?

d) Use the bar graph below to answer the following questions.



(1) What is the highest paid group?

(2) Which groups earn less than $40,000 yearly?

(3) Engineers earn approximately how many thousand dollars less than lawyers?

IX. B. CONTENT: Probability and statistics; Probability

OBJECTIVE: The student will be able to:

1. Find the probability involved in a coin toss, the roll of a die, a turn of a spinner, or a draw of marbles or cards.
2. Interpret probability statements encountered in everyday situations.

IX. B. 1. and 2. ACTIVITIES: 1. Complete the following.

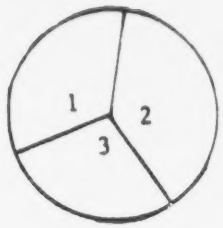
(a) Flip a coin.

(1) Are the outcomes equally likely?
(2) P(Heads)
(3) P(Tails)

IX. Probability and statistics

IX. B. 1. and 2.

b)



Spin the spinner.

(1) Are the outcomes equally likely? _____
(2) P(1) = _____
(3) P(2) = _____
(4) P(3) = _____

c) A cube is numbered from 1 to 6 on each of its sides. What is the probability of each of the following outcomes when the cube is tossed?

(1) P(1)
(2) P(2)
(3) P(5)

d) A drawer contains six blue bows, four green bows, and two red bows. Two bows are drawn at random without replacement. If a blue bow is drawn first, determine the probability for the second draw.

(1) P(blue) _____
(2) P(green) _____
(3) P(red) _____

IX. C. CONTENT: Probability and statistics; Statistics

OBJECTIVE: The student will be able to find the mean, mode, median, and range of a set of data.

ACTIVITIES: Find the mean, mode, median, and range of each given set of data.

a) 24 ft., 36 ft., 26 ft., 36 ft.

b) 9.4 mi., 10.1 mi., 9.4 mi., 9.2 mi.

IX. Probability and statistics

IX. C. c)

Test Scores on Pre-Algebra							
Week	1	2	3	4	5	6	7
Percent	86%	92%	94%	84%	92%	83%	85%

IX. D. CONTENT: Probability and statistics; Problem solving

OBJECTIVE: The student will be able to solve word problems involving graphs, probability, or statistics.

ACTIVITIES: Solve each.

a) The attendance figures at the first four games of the New Orleans Saints were: 64,530; 58,713; 62,971; and 64,234. What was the mean attendance?

b) Ticket prices for the home games were as follows: $10.00, $12.00, $15.00, and $25.00. What is the median price of a ticket?

c) Write mean, mode, median, or range to complete the sentence.

(1) 23 + 27 + 16 + 26 = 92
92 ÷ 4 = 23
The _____ is 23.

(2) 102, 120, 130, 135
(120 + 130) ÷ 2 = 125
The _____ is 125.

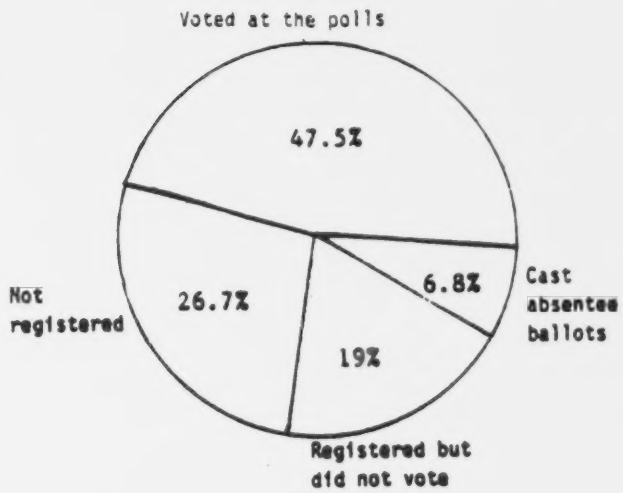
(3) 123, 144, 126, 123, 187
The _____ is 123.

(4) 123, 144, 126, 123, 187
187 - 123 = 54
The _____ is 54.

IX. Probability and statistics

IX. D.

d) The circle graph below shows the voting status of 185,000 people eligible for voting in the capitol city for the Governor's race.



(1) How many people voted in the capitol city Governor's race?
(2) Approximately how many people were not registered to vote?
(3) How many people cast absentee votes?

e) There are 100 chips in a sack. Of these, 50 are black, 30 are white, and 20 are red. You draw one chip without looking. State each probability below as a ratio and as a percent.

(1) P(black)
(2) P(black or white)
(3) P(blue)

X. Geometry

X. A. CONTENT: Geometry; Points, lines, planes

OBJECTIVES: The student will be able to:

1. Give an example of
   a) Point
   b) Line
   c) Plane
2. Draw and label a
   a) Ray
   b) Line segment

X. A. 1. ACTIVITIES:

1. Give an example of a
   a) Point
   b) Line
   c) Plane

X. A. 2.

2. Draw and label a
   d) Ray
   e) Line segment

X. B. CONTENT: Geometry; Angles

OBJECTIVE: The student will be able to:

1. Define and classify angles as acute, obtuse, right, or straight.
2. Identify congruent angles.
3. Recognize that the sum of the measure of the interior angles of a triangle is 180°.
4. Measure and draw angles using a protractor.
5. Construct an angle using a straight edge and compass.

X. B. 1. ACTIVITIES:

1. Rotate two strips of heavy paper attached with a brad (metal fastener) to show the various angles. Have students practice identifying the types and/or have students show various angles. Use a protractor to measure each angle.

X. B. 2.

2. Have students draw an angle then construct a copy of that angle. They should check their work by using a protractor to measure the angles.

X. B. 3.

3. Have students draw two different triangles. Have them use a protractor to measure each angle inside the triangle and find their sum. Then have each student give their findings orally.

X. Geometry

X. B. 4. 4. On paper, have students construct a duplicate of a given angle with identical measure (using a protractor).

X. B. 5. 5. Activity #4 may be used if compass and straightedge are substituted for protractor.

X. C. CONTENT: Geometry; Circles

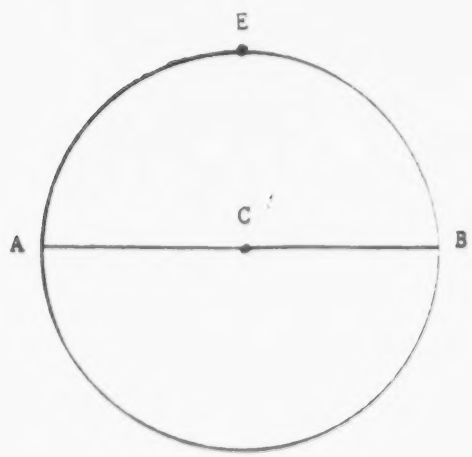
OBJECTIVES: The student will be able to:

1. *Identify the parts of a circle.
2. *Recognize and use π in fraction or decimal form.
3. *Determine the area and circumference of a circle.

XI. C. 1. ACTIVITIES:

1. Draw the figure below on the chalkboard. Have students reproduce the figure on paper. As a group, define and label each part.

Example:



X. Geometry

X. C. 2. and 3. 2. and 3. a) Have students construct [illegible] construction paper and cut [illegible]. Using a ruler, students [illegible] the diameter and record [illegible] answer.

Using this information, have students [illegible] the circumference ($C=\pi$) using both $\frac{22}{7}$ and 3.14 as numerical values for π.

Example: a) D = 12 inches

$$C = \frac{22}{7}(12)$$

$$C = 3.14(12)$$

Repeat the same procedure to determine the circumference using the radius.

Example: R = 6 inches

$$C = 2\left(\frac{22}{7}\right)(12)$$

$$C = 2(3.14)(12)$$

As an extended activity, have students use a length of string to measure the distance around the circle. Have students compare the results from this method to the results using the formula.

BEST COPY AVAILABLE

X. Geometry

X. D. CONTENT: Geometry; Polygons

OBJECTIVE: The student will be able to:

1. a) Define regular polygons.

   b) Identify and classify 3 to 10 sided polygons.

2. a) Define irregular polygon.

   b) Construct irregular polygons.

ACTIVITIES: 1. Fill in the chart with the definitions and indicated figures. (A form for this activity is included in the appendix.)

X. Geometry

	Regular Polygon:			
	Irregular Polygon:			
Number of Sides:	3	4	5	6
Type ↓				
Regular				
Irregular				
	7	8	9	10
Sides→				
Regular				
Irregular				

2. Identify "real-life" objects in the regular polygon categories. (Ex.: stop-sign-octagon)

X. E. CONTENT: Geometry; Triangles

OBJECTIVES: The student will be able to:

1. Identify the attitude and base of a triangle.
2. Classify triangles according to sides.
3. Classify triangles according to their angles.
4. Identify the parts of a right triangle.
5. *Determine the area of a triangle.
6. *Use the Pythagorean Rule.

X. E. ACTIVITIES: 1., 2., 3., and 4.

1. 2. 3. & 4. After defining the three types of triangles (scalene, isoceles, equilateral), have students use construction paper to make models of triangles with suggested lengths and record them in a chart similar to the one below.

Triangle	Lengths of sides (cm)		
Scalene	12	16	20
Isoceles	20	20	30
Equilateral	12	12	12

X. Geometry

Complete the activity by allowing students to measure the base and altitude of each.

Extension: First have students use protractors to measure each angle within the triangle and label them as acute, right, and obtuse. Second, after determining which of the triangles is a right triangle, have students label the parts.

X. E. 5. 5. Have students cut a square (of designated measurements) out of construction paper. They are then to calculate the area of the square using the appropriate formula (A=L•W). They should then be directed to fold the square diagonally to form a triangle. Have students measure the base and height (altitude) of the triangle.

X. E. 5. Then have them compute the area of the triangle using the formula $A = \frac{b \cdot h}{2}$ or $A = \frac{1}{2}(b \cdot h)$. Compare the area of the triangle to the area of the square. Remind the students that they made the triangle by folding the square in half. Does the calculated area agree with this; e.g., does the area of the triangle equal half the area of the square?

X. E. 6. 6. The lengths of the sides of a triangle are given. Is the triangle a right triangle? (c is length of hypotenuse)

a) a = 9, b = 12, c = 15
b) a = 4, b = 5, c = 6
c) a = 10, b = 15, c = 20
d) a = 10, b = 24, c = 26

X. F. CONTENT: Geometry; Quadrilaterals

OBJECTIVES: The student will be able to:

1. Identify types of quadrilaterals.
2. Identify the altitude and base(s). of a trapezoid and parallelogram.
3. Determine the area of quadrilaterals.

X. Geometry

X. F. 1. and 2. ACTIVITIES: 1. and 2. First, have students draw representations of the five types of quadrilaterals and label their drawings. Then, have students draw and label the altitude and base(s) of a trapezoid and a parallelogram.

X. F. 3. 3. Have students, using the appropriate formula, determine the area of each figure and compare the procedures.

a) A trapezoid with b_1 = 4cm, b_2 = 2cm, h = 5cm
b) A square with S = 5 ft.
c) *A parallelogram with b = 6m, h = 8m
d) A rectangle with l = 6 in, w = 2 in.

X. G. CONTENT: Geometry; Similar and congruent figures

OBJECTIVE: The student will be able to recognize similar and congruent figures.

X. G. ACTIVITIES:

a) In a container, put multiple copies of various figures. Have students select several figures and determine which of these are congruent and which are similar.

b) Have students cut out a variety of given shapes. Working in groups of three or four, have students determine which shapes are similar and which are congruent.

X. H. CONTENT: *Geometry; Problem solving

OBJECTIVES: The student will be able to solve problems

1. Involving volume of spatial figures.
2. Involving the conversion of area measures.

X. H. 1. ACTIVITIES: 1. Solve the following:

a) A cone and a cylinder both have a radius of 25 cm and a height of 30 cm. What is the volume of the cone? Of the cylinder?

b) A pyramid has a square base 8m on each side and a height of 10m. Find its volume.

c) A sphere has a radius of 6 inches. What is its volume?

d) A cube is 8 cm on each side. A rectangular solid has a length of 8 cm, a width of 4 cm, and a height of 5 cm. What is the volume of the cube? Of the rectangular solid?

X. H. 2.

2. a) How many square yards are there in a rectangular field that is 540 ft. long and 242 ft. wide?

b) A table top has the shape of a trapezoid with one base of 108 cm, another of 154 cm, and a height of 247 cm. Find the area of the table top in square meters.

EVALUATION TECHNIQUES

The importance of regular and frequent evaluation is nowhere more obvious than in the area of mathematics where skills are built in a cumulative manner. Frequent short quizzes should be used to determine understanding and mastery of each concept as it is taught. Longer tests covering related concepts and their relevance in problem solving should be administered at the conclusion of each unit. Comprehensive examinations covering all concepts and skills are very important at the end of each semester and at the end of each year. The sample items in the activities section of this guide represent ideas for examination problems but are by no means recommended for use as they are presented in this book. These evaluative techniques are to be used to measure the degree of achievement by the students with the understanding that there are many other types of tools for the measurement of student progress in achieving curricular objectives.

A basic goal in teaching mathematics should be to aid the student in becoming a competent problem solver. It is not enough to teach mathematical skills. The student must also be provided an opportunity to practice the application of these mathematical skills to successfully solve problems. The student's ability to solve problems logically should be evaluated regularly since it is a lifetime skill which carries over into all areas of living.

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3. Forbes, Jack E., et al. Mathematics, New York: MacMillan Publishing Company, 1985. 523 pp.

4. Gerardi, William J., et al. General Mathematics, New York: Harcourt Brace Jovanovitch, 1982. 472 pp.

5. Hawley, Newton and Patrick Suppes. Key to Geometry, Berkeley, California: Key Curriculum Project, 1979. 55 pp.

6. Resources for Special Needs, Irvine, California: Laïdlaw Brothers. 20 pp.

7. Stenzel, Jane G., More Instant Math Activities and Games, Englewood Cliffs, New Jersey: Prentice Hall Learning Systems, Incorporated. 80 pp.

8. Stokes, William T. Notable Numbers, Sunnyvale, California: Stokes Publishing Company, 1974. 107 pp.

STATE-APPROVED TEXTBOOKS

Grade Eight:[1]

Addison-Wesley Mathematics. Book 8. Addison-Wesley: 1985.

Mathematics Today. Gold. Harcourt: 1985.

Harper and Row Mathematics Series. Grade 8. Harper & Row: 1985.

Heath Mathematics Series. Grade 8. Heath: 1985.

Holt Mathematics Series. Book 8. Holt: 1985.

Houghton-Mifflin Mathematics. Grade 8. Houghton-Mifflin: 1985.

Using Mathematics 8. Laidlaw Brothers: 1984.

Series M: Macmillan Mathematics. Grade 8. Macmillan: 1985.

Invitation to Mathematics. Grade 8. Scott, Foresman: 1985.

Mathematics II[2]:

Essentials for Algebra: Concepts and Skills. Houghton-Mifflin: 1984.

Preparing to Use Algebra. Laidlaw Brothers: 1984.

Mathematics for Everyday Life. Charles E. Merrill: 1978.

Pre-Algebra: A Problem Solving Approach. 1st ed. Charles E. Merrill: 1982.

[1]The 8th grade text shown on the State adopted list will provide material related to the basic mathematics skills. Material for the elementary algebra concepts (Ex.: polynomials) will need to be provided from other resources.

[2]Math II (Pre-Algebra) texts, at the time, are generally geared toward a high school remediation program.

At this time, publishers are working on "introductory algebra" (Pre-Algebra) textbooks for "accelerated" programs.

Ex.: 1) Pre-Algebra, An Accelerated Course. Houghton-Mifflin.

2) Pre-Algebra. Heath.

(These are not yet on the State list.)

Algebra I - Low Track:

Algebra in Easy Steps. American.

Introductory Algebra 1. 4th ed. Harcourt: 1982.

Basic Algebra Houghton-Mifflin: 1977.

Elementary Algebra, Part 1. Houghton-Mifflin: 1983.

Elementary Algebra, Part 2. Houghton-Mifflin: 1983.

SUPPLEMENTS

*Algebra - Basic Skills. Workbook J. ESP, Inc., by Bearl Brooks: 1982.

*Algebra: An Introductory Course. Amsco School Publishing, Inc.: 1987.

*Algebra I, A Review Guide. Amsco School Publishing, Inc.: 1966.

Algebra I: Expressions, Equations and Applications. Amsco School Publishing. 1984.

Algebra I. Revised Edition. Houghton Mifflin Co. 1983.

Algebra: Know the Essentials Of. Hayes Publishing Co. 1968.

Algebra ½, An Incremental Development. Grassdale Publishers, Inc. 1983.

Developing Skills in Algebra I. Series - A,B,C,D. Dale Seymour Publications, P. O. Box 10888, Palo Alto, CA. 94300

Introduction to Algebra. Series I and II. Guid Association Publishing. 1979.

*Pre-Algebra with Pizzazz! Creative Publications. Palo Alto, CA. 94300.

Pre-Algebra. Houghton Mifflin Company. 1981.

Pre-Algebra - Know the Essentials Of. Hayes School Publishing Co. 1985.

*Highly recommended as resource for compiling supplemental material.

APPENDIX

1. prime number
2. composite number
3. base
4. exponent
5. square root
6. absolute value
7. real numbers
8. rational numbers
9. integers
10. whole numbers
11. natural numbers
12. term
13. like terms
14. monomial
15. binomial
16. trinomial
17. polynomial
18. greatest common factor
19. least common multiple
20. equation
21. linear equation
22. inequality
23. open sentence
24. replacement set
25. root
26. solution set
27. reflexive property
28. symmetric property
29. transitive property
30. rectangular coordinate system
31. ordered pair
32. horizontal axis
33. vertical axis
34. origin
35. quadrants
36. abscissa
37. ordinate
38. probability
39. statistics
40. mean
41. median
42. mode
43. range
44. geometry
45. point
46. line
47. plane
48. ray
49. line segment
50. angle
51. adjacent angles
52. complementary angles
53. supplementary angles
54. vertical angles
55. parallel lines
56. perpendicular lines
57. transversal
58. corresponding angles
59. alternate interior angles
60. alternate exterior angles
61. circle
62. polygon
63. radius
64. diameter
65. circumference
66. semi-circle
67. chord
68. arc
69. regular polygon
70. irregular polygon
71. altitude
72. base
73. triangle
74. scalene triangle
75. isosceles triangle
76. equaliteral triangle
77. right triangle
78. hypotenuse
79. leg
80. quadrilateral
81. perimeter
82. area
83. volume
84. circumference
85. rectangle
86. trapezoid
87. parallelogram
88. rhombus
89. square
90. cube
91. rectangular solid
92. pyramid
93. sphere
94. cone

95. cylinder
96. sum
97. difference
98. product
99. quotient
100. Associative Property
101. Commutative Property
102. Distributive Property
103. Additive Identity Property
104. Multiplicative Identity Property
105. Closure Properties
106. Additive Inverse Property
107. Multiplicative Inverse Property
108. Multiplicative Property of Zero
109. Property of Substitution
110. factors
111. scientific notation
112. coefficient
113. variable
114. pentagon
115. hexagon
116. heptagon
117. octagon
118. nonagon
119. decagon
120. ratio
121. simple interest
122. compound interest
123. interest
124. principal
125. rate
126. pi
127. pythagorean rule
128. +
129. −
130. ·
131. :
132. =
133. >, $\geq$
134. <, $\leq$
135. ≠
136. Grouping symbols: { } ( ) [ ] —— (horizontal bar, e.g., $\frac{2}{3}$
137. ≡
138. ≅
139. | |
140. ⊥
141. |a|
142. $\sqrt{\ }$
143. ∧
144. $\doteq$
145. ≠

SUBSETS OF REAL NUMBERS

Real Numbers - {the coordinate of a point on a numberline}

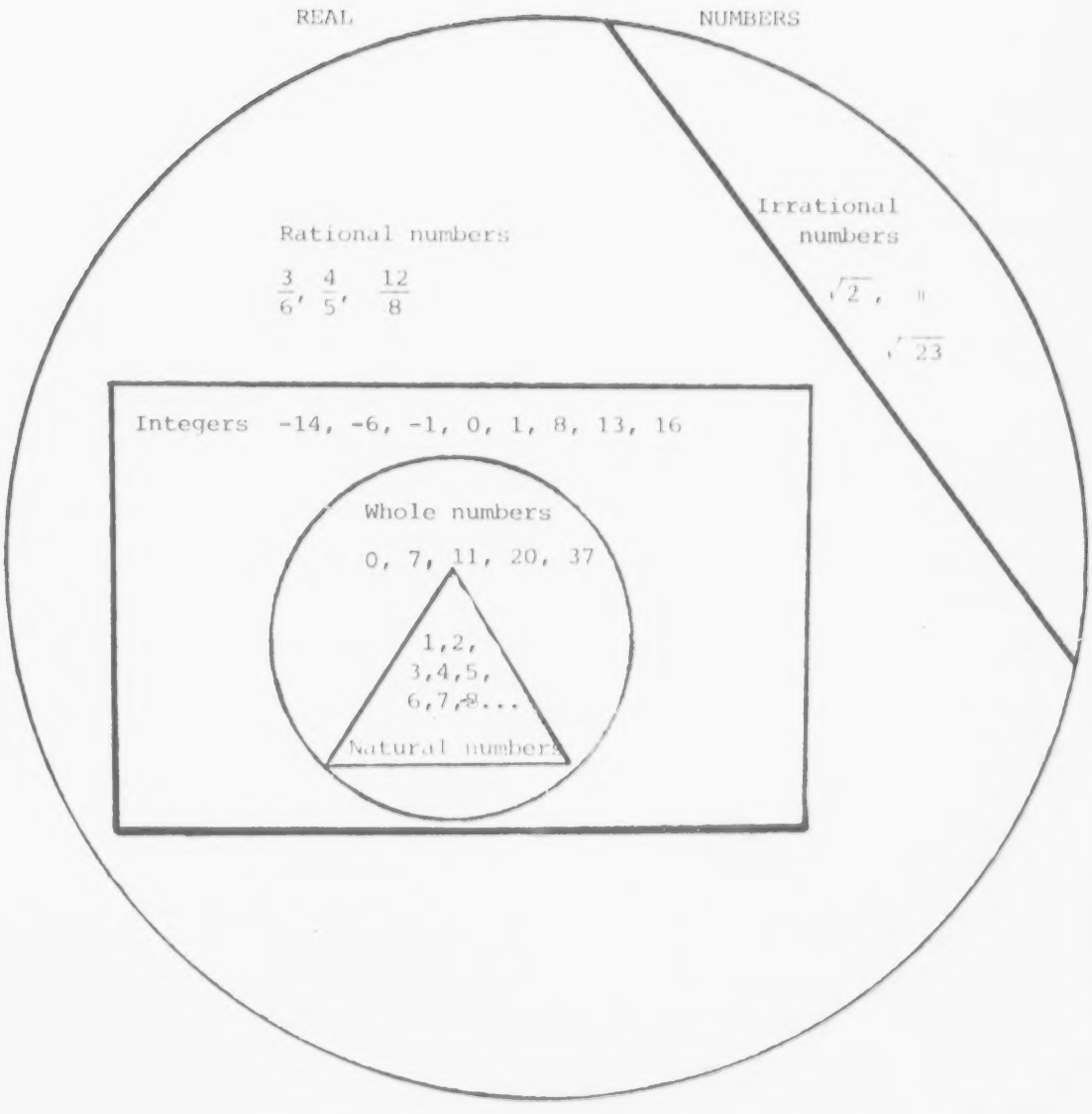
Natural or Counting Numbers - {1, 2, 3, 4, 5, 6, 7, 8, 9...}

Whole Numbers - {0, 1, 2, 3, 4, 5, 6, 7, 8...}

Integers - {...-2, -1, 0, 1, 2, 3...}

Rational Numbers - {any number in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$}

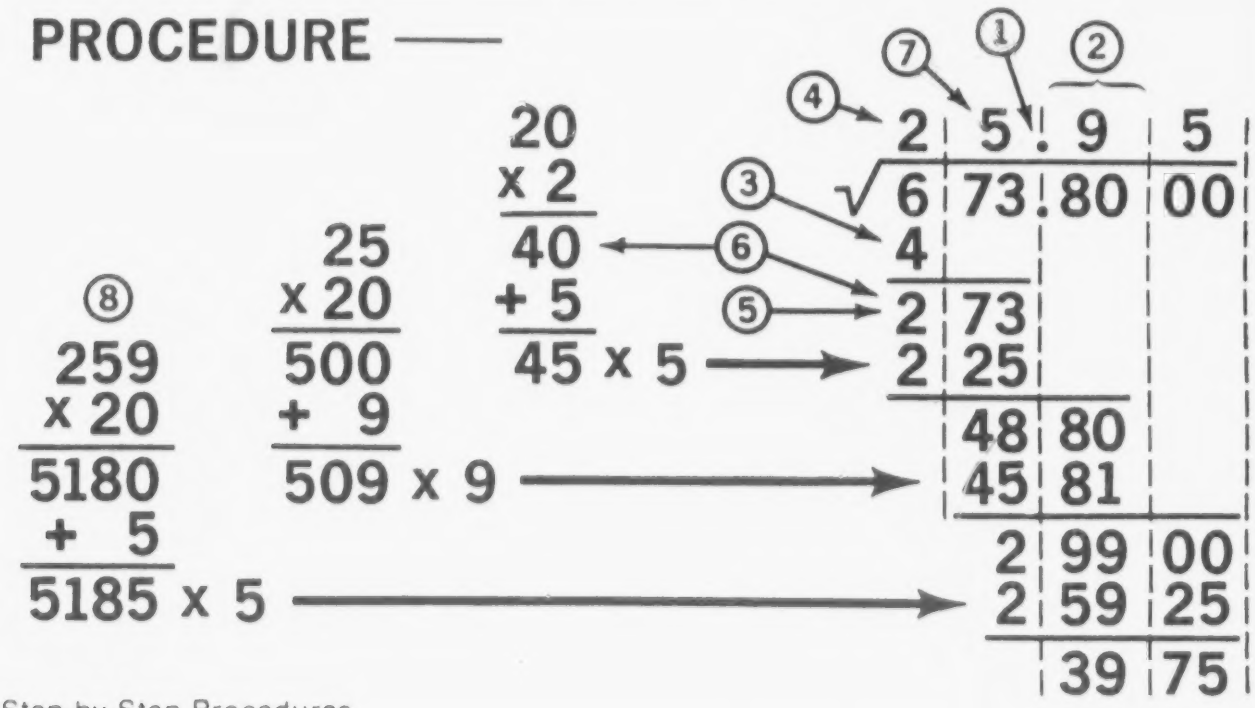
Irrational Numbers - {non-terminating, non-repeating decimal numbers}



EXTRACTING SQUARE ROOT

PROBLEM —— $X^2 = 673.8$ OR $X = \sqrt{673.8}$

PROCEDURE ——



Step-by-Step Procedures

1. Place the decimal point directly over the decimal point in the number.
2. Beginning at the decimal point, separate the number into groups of two figures each, called Periods. Add zeros if needed.
3. Find the largest perfect square contained in the first period (6). The largest perfect square that can be subtracted from (6) is 4.
4. Write the 4 under the (6) and the square root of 4 (2) above the (6).
5. Subtract the perfect square 4 from the first period (6) and bring down the next period 73 to form the number 273.
6. Multiply the first number of the answer (2) by 20 to obtain a trial divisor of (40). Mentally divide the (40) into the remainder 273, to see about how many times it will go. It goes approximately 5 times.
7. Write the 5 above the next period to obtain an answer so far 25, then add the 5 to the 40 equalling 45. Multiply 45 by 5 and subtract the product from 273. The new dividend is 4880.
8. Repeat this process until you have gone past the last period.

Reprinted from NOTABLE NUMBERS by William T. Stokes

PROBLEM-SOLVING PROCESS AND STRATEGIES
Introduction

The world that children will live in as adults will require that they acquire the skills to solve problems and to ask good questions. Mathematics should be taught so that mathematical concepts and skills make sense to the student. The emphasis on problems must come first; it is the starting place for developing arithmetic understanding and for establishing the need for computation. The student needs to see that developing computational skills serves a purpose--that computational skills are tools for solving problems.

The problem-solving process. The problem-solving process for mathematics has been described in a variety of ways, but at least four steps are identified in most models. These are:

1. Reading or understanding the problem
   --the student decides what s/he is trying to find and what information is needed or irrelevant.
2. Devising a plan
   --the student decides what problem-solving strategies are appropriate to use for the problem.
3. Carrying out the plan
   --the student uses selected strategies to compute the answer or solve the problem.
4. Checking the answer
   --the student reviews his/her answer to make sure that it is reasonable and verifies its accuracy.

It is clear from this description of the problem-solving process that mathematics instruction should be directed at teaching students "how to think." Students should be exposed when they are very young to problems that require thinking beyond rote response. To be effective in helping students to develop and sharpen their problem-solving skills, teachers should avoid illustrating all of the steps in the solution of numerical exercises. Instead, teachers should present relevant problems and guide students toward solutions rather than tell them the answers.

Asking good questions, for example, helps students go forward toward solutions. Allowing sufficient time for students to solve problems is also important; during this "wait time," the teacher does not talk, but allows students the opportunity to think or talk to one another. In general, students' exploration and discovery of solutions is more useful than passive reception of the answers in learning how to solve problems independently.

Problem-solving strategies. Research has shown that the teaching of specific problem-solving strategies greatly improves students' problem-solving abilities and results in dramatic increases in their scores on related tests. Strategies are not specific to particular problems or to particluar areas of the mathematics curriculum, but can be applied alone or in combination with other strategies to solve a wide variety of problems. Gaining familiarity with different strategies, seeing them modeled, and then trying to apply them can provide students with useful tools for tackling problems.

Although the list may not be comprehensive, the thirteen problem-solving strategies identified below constitute a good repertoire of strategies that can serve as a basis for solving problems in school and in life.

1. Uses common word problem strategies to solve problems.
2. Breaks problems into parts to solve two-step or multi-step problems.
3. Uses trial and error to solve problems (guess and check).
4. Uses dramatization to solve problems.
5. Uses concrete objects to solve problems.
6. Draws pictures or diagrams to solve problems.
7. Given relevant information, works backwards to solve problems.
8. Looks for patterns to solve problems.
9. Constructs and uses tables, lists, and charts to solve problems.
10. Solves a similar or simpler problem to help find a solution.
11. Constructs and interprets graphs to solve problems.
12. Writes simple equations to solve problems.
13. Uses logical reasoning to solve problems.

Examples of exercises designed to teach each of these thirteen strategies complete this section.

Suggestions for teaching problem solving. Presented below are a set of general suggestions for teaching problem solving

1. Provide a wholesome emotional climate for problem solving.
2. Teach various problem-solving strategies.
3. Emphasize the method of solution rather than the solution.
4. Encourage experimentation, trial and error, estimation, intuition, guessing and hunches to suggest a method of solution.
5. Expose students to many problems and to varied problems so that they develop flexibility in problem-solving behavior.
6. Provide sufficient time for discussion, practice, and reflection on problems and problem-solving strategies.
7. Have students construct their own problems.
8. Attempt to find the source of the students' difficulty and use various instructional techniques to remove these difficulties.
9. Insist on persistent effort and on concentrated and sustained attention.
10. Provide very frequent short sets of problems on which the students experience absolute success.
11. Promote problem solving through the use of mathematical games and other activities.
12. Have students work together in small groups.
13. Attempt to establish and maintain students' motivation.
14. Show the learner how to ask him/herself questions.
15. Give conscious attention to reading skills.
16. Use problem situations to discover new mathematical concepts, principles, or relationships.
17. Use problem situations as a basis for practice and as a substitute for isolated drill exercises.
18. Model good problem-solving behavior.

Regular Polygon:

Irregular Polygon:

Number of Sides:	3	4	5	6
Type ↓ Regular				
Irregular				

	7	8	9	10
Sides→ Regular				
Irregular				

ANSWER KEY

ANSWER KEY

I. A. Whole numbers; Addition

I. A. 1.
a) 2508
b) 190,574
c) 2,164,783
d) 18
e) 282
f) 272

I. A. 2.
a) 14
b) 14
c) 43
d) 294
e) 21
f) 136

I. B. Whole numbers; Subtraction

I. B. 1.
a) 145
b) 25,247
c) 685,444
d) 3,293,697
e) 612
f) 207
g) 549

I. B. 2.
a) 3
b) 9
c) 18
d) 266
e) 1391
f) 22,484

I. C. Whole numbers; Multiplication

I. C. 1.
a) 3182
b) 245,032
c) 3,300,990
d) 1,755
e) 11,904
f) 61,380
g) 80
h) 2,232

I. C. 2.
a) 35
b) 72
c) 988
d) 33,333

I. D. Whole numbers; Division

I. D. 1.
a) 7
b) 131
c) $172\frac{2}{5}$
d) 408
e) 173
f) 109
g) $11\frac{22}{23}$
h) $9\frac{346}{721}$
i) $153\frac{4}{226}$ or $153\frac{2}{113}$

I. D. 2.
a) 8
b) 9
c) 8
d) 561
e) 362

I. E. Whole numbers; Order of operations

I. E. 1. a) 26
b) 3
c) 64
d) 40
e) 4

I. E. 2. a) 17
b) $9\frac{1}{2}$
c) 2
d) 28
e) 32
f) 18

I. F. Whole numbers; Properties

I. F. a) Additive identity
b) Commutative of addition
c) Closure of addition
d) Commutative of multiplication
e) Associative of addition
f) Multiplicative identity
g) Commutative of addition
h) Closure of multiplication
i) Commutative of multiplication
j) Associative of multiplication
k) Multiplicative identity
l) Associative of multiplication
m) Closure of multiplication
n) Associative of addition
o) Additive identity
p) Associative of multiplication

I. G. Whole numbers; Problem solving

I. G. 1. a) 2 ft. 6 in.
b) 686 m
c) 96 km

I. G. 2. a) 96 lb. 9 oz.
b) 91 kg

I. G. 3. a) 3 gal. 1 qt.
b) 18 l

II. A. Decimals; Place value

II. A. 1. a) Three and forty-six hundredths
b) Ten and one hundred one thousandths
c) Seven and one hundred sixty-three millionths
d) Two billion, four hundred sixty-three million, seven hundred twelve thousand, one hundred thirty-eight and four thousand one hundred seventy-eight ten thousandths.
e) One hundred sixty-eight trillion, seven hundred nineteen billion, five hundred three million, four hundred twenty-five thousand, one hundred six and two hundred sixteen thousandths.

II. Decimals; Place value

II. A. 2. a) 3.005
b) 1.0875
c) 284.0015
d) 10,000,142.9
e) 5,008.000023

II. B. Decimals; Addition

II. B. 1. a) 1.2751
b) 96.8558
c) 22.0074
d) 15.253
e) 21.081259
f) 23,469.68057

II. B. 2. a) 8.4
b) 167.536
c) 0.066169
d) 5,238.8703

II. C. Decimals; Subtraction

II. C. 1. a) 1.451
b) 1.079
c) 62.5716
d) 19.61506
e) 171.14
f) 0.45762

II. C. 2. a) 0.9
b) 1.03
c) 5.777
d) 6.541

II. D. Decimals; Multiplication

II. D. 1. a) 20.88
b) 28.2348
c) .00081
d) .0036782

II. D. 2. a) 30.683
b) .099
c) 27.091806
d) 2.7824
e) .05412

II. E. Decimals; Division

II. E. 1. a) 0.8
b) 2.4
c) 75.9
d) 40
e) 0.003
f) 28,923.1

II. E. Decimals; Division

II. E. 2.	a)	1.3	d)	15.038
	b)	40	e)	80
	c)	39.0425	f)	0.249

II. F. Decimals; Conversions

II. F. 1.	a)	$\frac{4}{5}$	c)	$\frac{1}{8}$
	b)	$\frac{1}{2}$	d)	$\frac{1}{4}$
II. F. 2.	a)	$3\frac{2}{5}$	c)	$10\frac{5}{8}$
	b)	$2\frac{3}{4}$	d)	$7\frac{1}{2}$

II. G. Decimals; Order of operations

II. G. 1.	a)	5.924	d)	42.9414
	b)	11.045	e)	37.15632
	c)	2.5992		
II. G. 2.	a)	8.3561	d)	2.764956
	b)	10.852	e)	6.0304272
	c)	1.17507		

II. H. Decimals; Ordering and comparing

II. H. 1.	a)	<
	b)	>
	c)	>
	d)	>
	e)	<
II. H. 2.	a)	.67, 6.07, 6.70
	b)	.4067, .46, .467
	c)	6.030, 6.29, 6.3
	d)	37.72, 57.61, 57.62, 57.63
	e)	2.1349, 21.349, 213.49, 2134.9

II. I. Decimals; Problem solving

II. I.	a)	$9.85
	b)	$214.00
	c)	$1.54
	d)	$2.24
	e)	liver; hamburger

III. A. Number theory; Divisibility tests

III. A.
a) (1) -4,280
b) (3) -5,655
c) (2) -1,008
d) (3) -625
e) (1) -726
f) (1) -396
g) (3) -4,280

III. B. Number theory; Prime factors

III. B. 1. Teacher graded.

III. B. 2. a) 1, 2, 3, 4, 6, 8, 12, 24
Prime: 2, 3
Composite: 4, 6, 8, 12, 24

b) 1, 2, 4, 13, 26, 52
Prime: 2, 13
Composite: 4, 26, 52

c) 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60
Prime: 2, 3, 5
Composite: 4, 6, 10, 12, 15, 20, 30, 60

d) 1, 2, 3, 4, 6, 9, 12, 18, 36
Prime: 2, 3
Composite: 4, 6, 9, 12, 18, 36

III. B. 2. e) 1, 2, 4, 5, 10, 20
Prime: 2, 5
Composite: 4, 10, 20

f) 1, 2, 3, 6, 9, 18
Prime: 2, 3,
Composite: 6, 9, 18

III. C. Number theory; Exponents

III. C. 4. a) 81
b) 1
c) 8

III. C. 5. a) y^2
b) n^3
c) x^4

III. F. Number theory; Scientific notation

III. F. 1. a) 3.4×10^2
b) 5.6×10^3
c) 1.27×10^1
d) 6×10^6
e) 8.47×10^5
f) 5.9×10^0

III. F. 2. a) 20,000
b) 3,400,000
c) 580
d) 43.2
e) 610,000
f) 8,000,000,000

III. G. Number theory; Order of operations

III. G. 1. a) 23
b) 10
c) 13
d) 4

III. G. 2. a) 158
b) 18
c) 320

IV. A. Fractions; Renaming fractions

IV. A. a) 6
b) 28
c) 49
d) 42
e) 3
f) 7

IV. B. Fractions; Multiplication

IV. B. 1. and 3. a) $\frac{1}{6}$
b) $\frac{15}{28}$
c) $\frac{3}{5}$
d) $\frac{4}{9}$

IV. B. 2. and 3. a) 9
b) $2\frac{1}{5}$ or $\frac{11}{5}$
c) $5\frac{1}{3}$ or $\frac{16}{3}$
d) $19\frac{1}{2}$ or $\frac{39}{2}$
e) $2\frac{1}{2}$ or $\frac{5}{2}$

IV. C. Fractions; Division

IV. C. 1. a) $\frac{1}{2}$

b) 3

c) $\frac{2}{3}$

d) 9

e) $\frac{1}{a}$

f) c

g) $\frac{a}{b}$

h) $\frac{8}{3m}$

IV. C. 2. a) $3\frac{1}{3}$ or $\frac{10}{3}$

b) $\frac{2}{3}$

c) $\frac{8}{15}$

d) $1\frac{1}{2}$ or $\frac{3}{2}$

IV. C. 3. a) $\frac{1}{20}$

b) $1\frac{1}{2}$ or $\frac{3}{2}$

c) $2\frac{2}{3}$ or $\frac{8}{3}$

d) $\frac{14}{19}$

e) $\frac{8}{81}$

IV. D. Fractions; Addition

IV. D. 1. a) $\frac{8}{9}$

b) $\frac{7}{8}$

c) $\frac{13}{17}$

d) $14\frac{2}{3}$

e) $4\frac{4}{5}$

f) $7\frac{4}{7}$

IV. D. 2. a) $\frac{2}{3}$

b) $\frac{1}{2}$

c) 1

d) $\frac{3}{5}$

IV. D. Fractions; Addition

IV. D. 3. a) $\frac{3}{7}$

b) $1\frac{1}{2}$ or $\frac{3}{2}$

c) $1\frac{2}{15}$ or $\frac{17}{15}$

IV. D. 4. a) $1\frac{1}{2}$ or $\frac{3}{2}$

b) $9\frac{6}{11}$

c) $13\frac{1}{3}$

d) $6\frac{1}{12}$

IV. E. Fractions; Subtraction

IV. E. 1. a) $\frac{1}{3}$

b) $\frac{2}{5}$

c) $3\frac{1}{5}$

d) $5\frac{3}{4}$

e) $1\frac{2}{3}$

IV. E. Fractions; Subtraction

IV. E. 2. and 3.

a) $\frac{3}{4}$

b) $\frac{3}{5}$

c) $\frac{5}{14}$

d) $1\frac{2}{3}$

e) $2\frac{1}{5}$

f) $1\frac{25}{36}$

IV. F. Fractions; Order of operations

IV. F. 1. and 2.

a) $\frac{1}{2}$

b) $\frac{1}{4}$

c) $\frac{1}{8}$

d) 21

e) $2\frac{1}{24}$ or $\frac{49}{24}$

f) $2\frac{1}{4}$ or $\frac{9}{4}$

g) $\frac{1}{36}$

h) $6\frac{3}{4}$ or $\frac{27}{4}$

IV. G. Fractions; Fractional conversions

IV. G. 1. and 2.

a) 0.6
b) 0.7
c) 0.48
d) $0.7\overline{7}$
e) $0.91\overline{6}$
f) 1.625
g) 1.25
h) 3.2
i) $2.\overline{8}$
j) 1.625

IV. H. Fractions; Ordering and comparing

IV. H. 1.

a) <
b) =
c) <
d) =
e) =
f) <
g) >
h) =
i) >

IV. H. 2.

a) $\frac{1}{2}, \frac{3}{5}, \frac{2}{3}$

b) $\frac{3}{8}, \frac{5}{12}, \frac{1}{2}, \frac{13}{24}$

c) $\frac{17}{42}, \frac{4}{7}, \frac{13}{21}, \frac{2}{3}, \frac{5}{6}$

d) $\frac{5}{28}, \frac{1}{4}, \frac{2}{7}$

e) $\frac{2}{3}, \frac{13}{18}, \frac{5}{6}, \frac{8}{9}$

f) $\frac{17}{30}, \frac{2}{3}, \frac{4}{5}, \frac{5}{6}, \frac{9}{10}$

IV. I. Fractions; Problem solving

IV. I.

a) \$7.40
b) \$103.50
c) \$9.50

V. A. Ratio, proportion, percent; Ratio

V. A.

a) $\frac{3}{5}$
b) $\frac{10}{25}$ or $\frac{2}{5}$
c) $\frac{2}{12}$ or $\frac{1}{6}$
d) $\frac{11}{21}$

V. B. Ratio, proportion, percent; Proportion

V. B. 1.

a) yes
b) yes
c) no
d) no

V. B. 2.

a) means: 4,3
extremes: 2,6
b) means: 8,16
extremes: 6,24

V. B. Ratio, proportion, percent; Proportion

V. B. 3. a) 8
b) 4

V. C. Ratio, proportion, percent; Percent

V. C. 1. a) 25%
b) 20%
c) 66 2/3%
d) 150%
e) 225%

V. C. 2. a) .75
b) .52
c) .00403

V. C. 3. a) $\frac{3}{5}$
b) $\frac{53}{100}$
c) $\frac{11}{25}$

V. C. 4. a) $\frac{15}{25}$ = 60% increase
b) $\frac{15}{40}$ = 37.5% decrease
c) $\frac{12}{100}$ = 12% increase
d) $\frac{110}{200}$ = 55% decrease
e) $\frac{110}{90}$ = $122\frac{2}{9}$ % increase

V. C. 5. a) 0.008 = .8%
b) 0.0025 = .25%
c) (1) .125
(2) .5
(3) 25

V. C. 6. Simple interest is defined by the following rule: Interest is equal to principal times rate times time. R is expressed as a decimal; T is years that principal is borrowed. (I = P · R · T)

V. C. Ratio, proportion, percent; Percent

V. C. 6. Compound interest is the interest on principal, plus all previously computed interest. For compound interest, the principal P increases to the amount A by the following rule: $A = P(1+i)^n$, where

P is principal
i is rate per time period
n is the number of time periods, and
A is the amount after n periods of time

V. C. 7. a) Salary is the amount of earned wages
b) Commission is a percentage of the amount of a sale paid as wages.

V. D. Ratio, proportion, percent; Problem solving

V. D. 1. a) $800
b) $105

V. D. 2. a) $59.38
b) $2.97
c) $4.00
d) 25%

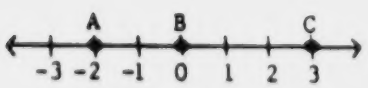
VI. A. Integers, rational numbers, real numbers; Definitions

VI. A. 1. a) 1, 2, 3, 4, 6
b) 6, 4
c) 6, 4
d) 6, 4, 3, 2, 1
e) 6, 5
f) 6, 5
g) 6, 4, 3, 2, 1
h) 6, 4

VI. B. Number line; Construction

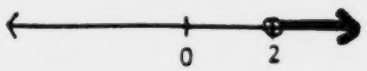
VI. B. 1. a) -2
b) 0
c) 1

VI. B. 2.

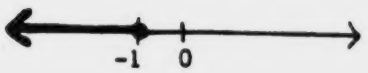


VI. D. Number line; Graphs of subsets

VI. D. a)



VI. D. b)



VI. D. c)

VI. E. Number line; Absolute value

VI. E. a) Absolute value: the number of units a number is from zero on a number line.

b) (1) 2
(2) 0
(3) 4
(4) $\frac{1}{2}$

VI. F. Integers, rational numbers, and real numbers; Operations

VI. F. 1. and 2.

1.		2.			
a)	5	a)	$1\frac{1}{4}$ or $\frac{5}{4}$	q)	16.05
b)	-1	b)	$\frac{7}{24}$	r)	3.741
c)	2	c)	$2\frac{5}{6}$ or $\frac{17}{6}$	s)	-13.244
d)	-8	d)	$-15\frac{5}{6}$	t)	-17.78
e)	2	e)	$\frac{1}{6}$	u)	1.43
f)	-11	f)	$-\frac{11}{18}$	v)	-1.78
g)	11	g)	$6\frac{3}{20}$	w)	38.35
h)	2	h)	$-3\frac{1}{2}$	x)	-3.8
i)	30	i)	$\frac{1}{6}$	y)	14.911
j)	-21	j)	$-\frac{5}{21}$	z)	-0.081
k)	-54	k)	-1	aa)	-0.07
l)	32	l)	$1\frac{1}{2}$ or $\frac{3}{2}$	bb)	0.03475
m)	3	m)	$1\frac{1}{3}$ or $\frac{4}{3}$	cc)	40
n)	-2	n)	-3	dd)	-15.8
o)	-8	o)	$-\frac{1}{6}$	ee)	-541
p)	5	p)	$\frac{1}{5}$	ff)	520

VI. G. Integers, rational numbers, and real numbers; Order of operations

VI. G.
a) 4.6
b) -39.1

VI. H. Integers, rational numbers, and real numbers; Properties

VI. H.

a)	(8)	g)	(6)
b)	(10)	h)	(2)
c)	(5)	i)	(9)
d)	(1)	j)	(4)
e)	(11)	k)	(7)
f)	(3)		

VI. I. Integers, rational numbers, and real numbers; Problem solving

VI. I.
a) $3(-5) = -15$
b) $6(-10.6) = -63.6$
c) $(3\frac{1}{2})(2.75) = 9.625$ or \$9.63

VII. Elementary algebra

VII. A. 1. a) 50
b) 3
c) 19
d) 81
e) 37
f) $\frac{1}{2}$
g) -1.18

VII. A. 2. a) B = {8, 10, 12}
b) B = {40, 50, 60}
c) B = {6, 7, 8}
d) B = {23 $\frac{1}{3}$, 29 $\frac{1}{3}$, 35 $\frac{1}{3}$ }
e) B = {240, 340, 456}

VII. Elementary algebra

VII. B. 1. a) (1) f
(2) d
(3) b
(4) a
(5) e
(6) c

VII. B. 1. b) and c)

(1) like
(2) unlike
(3) like
(4) unlike
(5) like
(6) like
(7) unlike
(8) like
(9) unlike
(10) like

VII. B. 1. d) (1) $8x$
(2) $8mn$
(3) $20a^2b$
(4) $-5m$
(5) $2m$
(6) $-5.3y^2$
(7) $6x + 1y + 8z$
(8) $2c - 2\frac{1}{2}f$
(9) $4x^2 + 3$
(10) $-6bx + b^2x + 6$ or $b^2x - 6bx + 6$
(11) $6x + 6y$
(12) $9a - 3b$
(13) $-3x^2 - 15x - 21$
(14) $\frac{a+b}{c}$
(15) $\frac{5a}{5}$
(16) $\frac{9}{a}$
(17) $\frac{11}{15a}$
(18) $\frac{ad+cb}{bd}$
(19) $\frac{11c}{9}$
(20) $\frac{6}{b}$
(21) $\frac{1a}{n}$
(22) $\frac{2c}{9}$
(23) $\frac{3r}{10}$
(24) $\frac{1c}{2}$
(25) $\frac{11c}{36}$

VII. Elementary algebra

VII. B. 2.

1) $6b$
2) $.35c^2$
3) $-8xy$
4) $3t^3$
5) $-60abc$
6) $-3u^2y^4$
7) $-72c^3d^2$
8) $-6r^{10}s^6$
9) $-56txz$
10) $-6bc$
11) $\frac{8}{a}$
12) $\frac{7n}{13}$
13) $\frac{22m}{21}$
14) $\frac{5c}{6}$
15) $\frac{34}{15m}$
16) $\frac{2}{3a}$
17) $\frac{1}{3}$
18) $\frac{1}{4}$
19) $\frac{2}{3}$
20) $\frac{5ab}{8}$

VII. B. 3.

1) $12c + 6d$
2) $20b - 2f$
3) $-8x^2 + 20x$
4) $-18c^2 + 12c^3$
5) $m^2n + mn^2$
6) $3d^3 - 6d^2 + 12d$
7) $-8a - 14b$
8) $21a^3b^2 - 14a^3b^3$
9) $6f + 9g$
10) $-36e + 18e^2 + 54e^3$

VII. B. 4.

1) x^3
2) t^8
3) e^5
4) $z^0 = 1$
5) $3^3 = 27$
6) n^2
7) $2^3 = 8$
8) $x^{5a-2a} = x^{3a}$
9) S^{x-2}
10) $-5x^3$
11) $\frac{1}{5}$
12) $\frac{1}{3m}$
13) $\frac{17}{c}$
14) $\frac{33c}{4}$
15) $\frac{125}{6m}$
16) $\frac{b}{a}$
17) a^2
18) $\frac{3}{5}$
19) $\frac{a}{3}$
20) $\frac{5}{2}$
21) $4a^2b^4c^5$

VIII. Linear equations and inequalities of one variable

VIII. A.

a) reflexive
b) transitive
c) symmetric
d) transitive
e) reflexive
f) symmetric

VIII. B. 1.

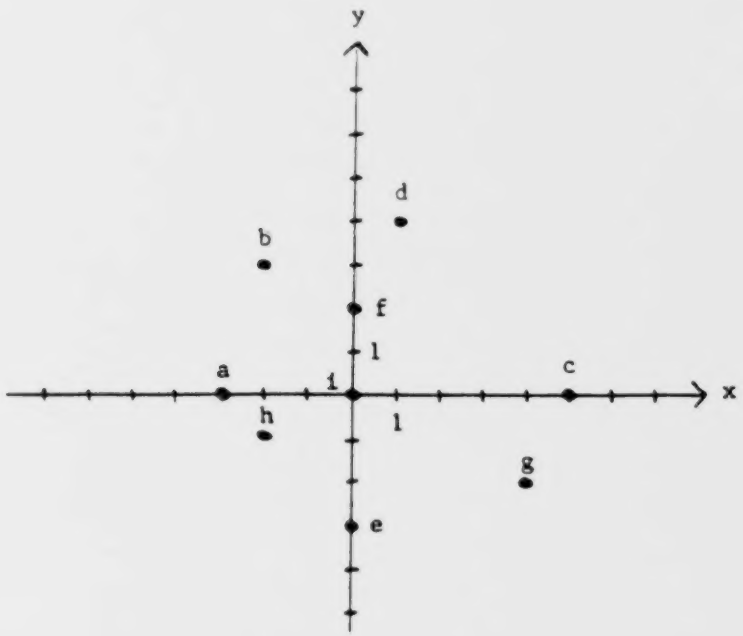
a) 3
b) -17
c) 8
d) 7
e) -3
f) 47
g) 8
h) -7
i) -27
j) 24
k) -18
l) -252

2. m) 5
n) 1
o) 24
p) 4
q) 2
r) -3
s) 1
t) -5

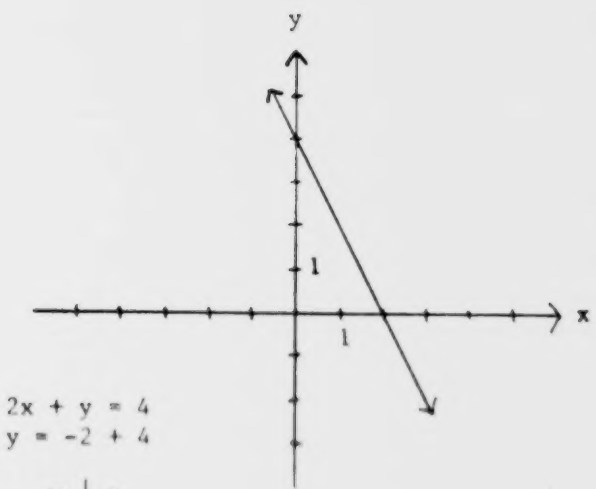
VIII. C. Linear equations; Graphing

VIII. C. 1.

a) axis, horizontal
b) quadrant, 2nd
c) axis, horizontal
d) quadrant, 1st
e) axis, vertical
f) axis, vertical
g) quadrant, 4th
h) quadrant, 3rd
i) axis, both



VIII. C. 2. a)



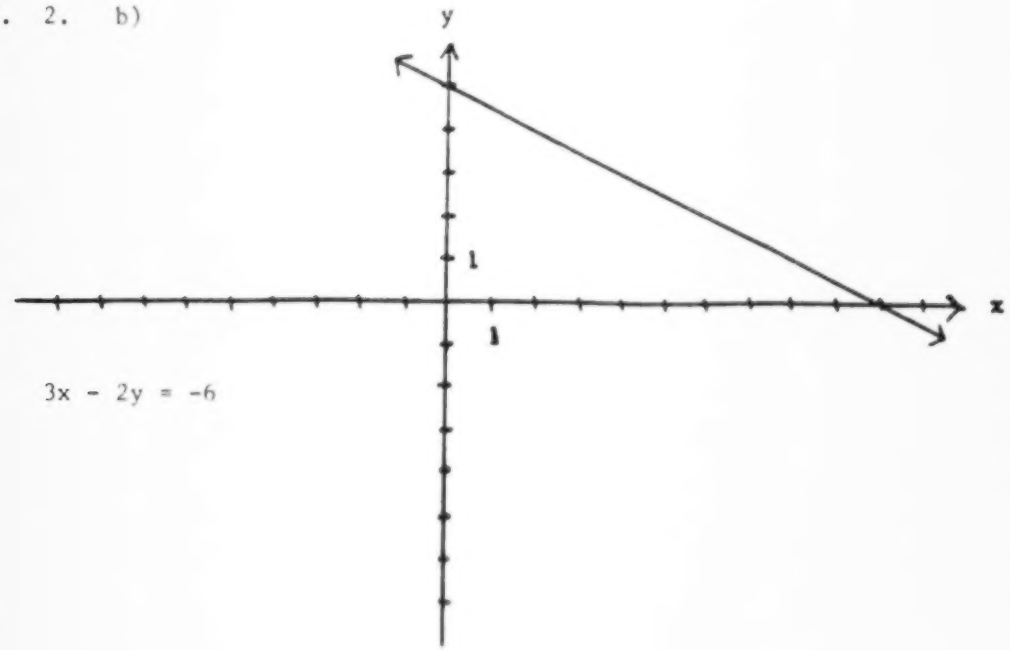
$2x + y = 4$

$y = -2 + 4$

x	y
0	4
2	0

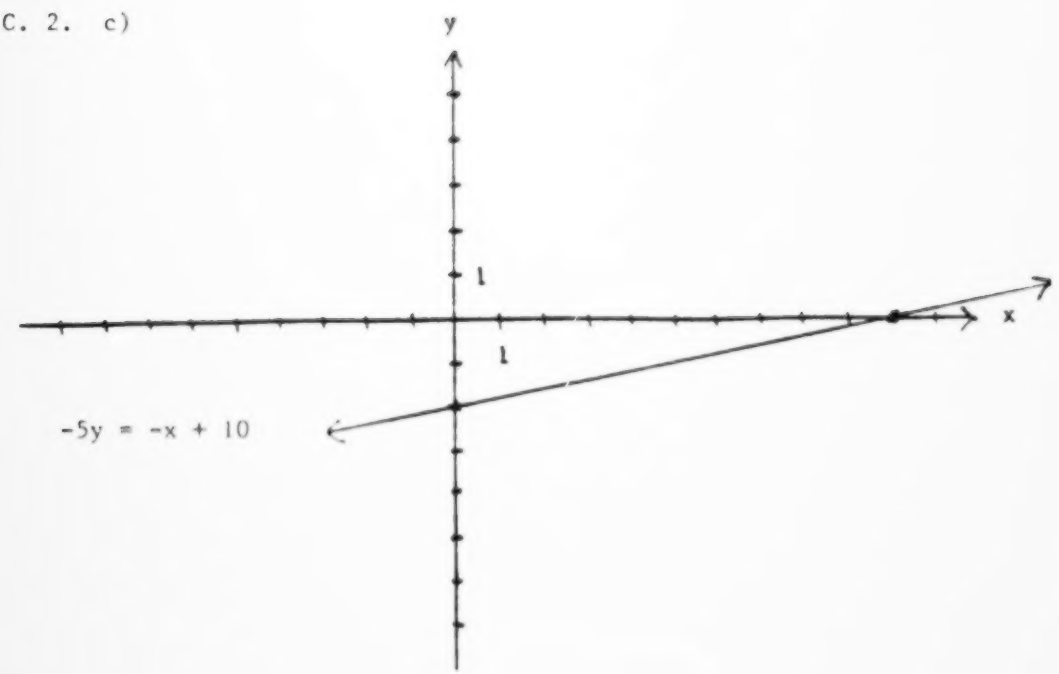
VIII. C. Linear equations; Graphing

VIII. C. 2. b)



$3x - 2y = -6$

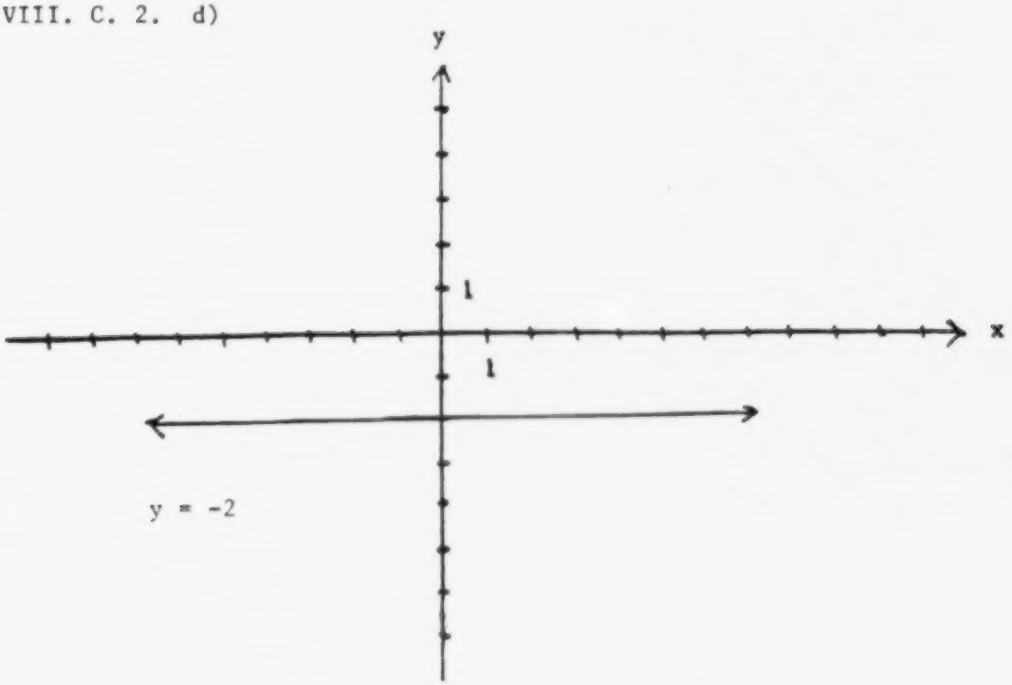
VIII. C. 2. c)



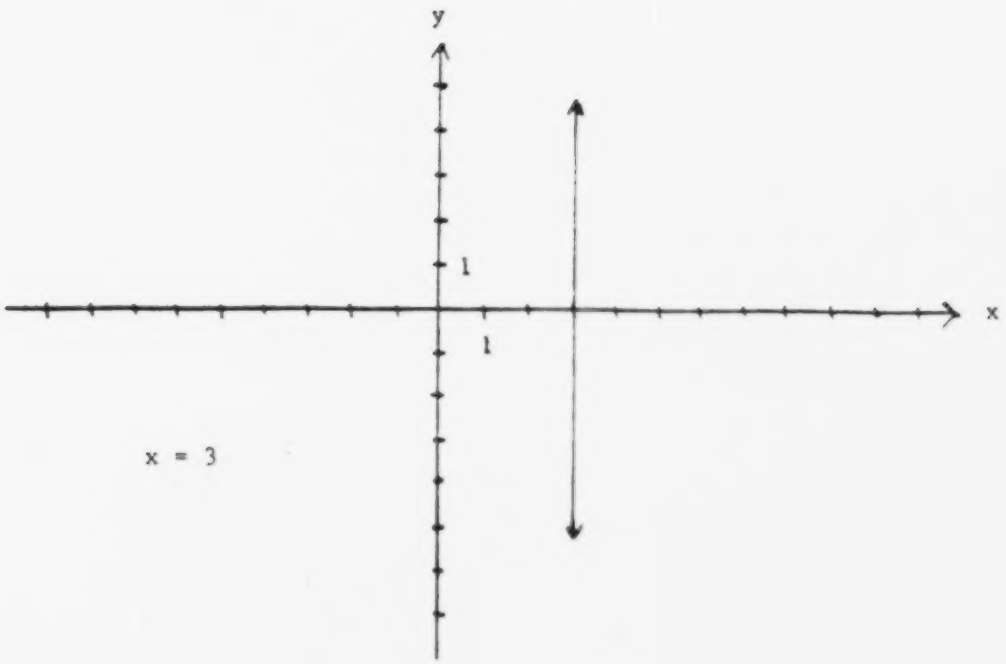
$-5y = -x + 10$

VIII. C. Linear equations; Graphing

VIII. C. 2. d)



VIII. C. 2. e)



VIII. D. Linear equations; Problem solving

VIII. D. 1. a) (1) $b + 8$ or $8 + b$
(2) $x - y$
(3) mn
(4) $12 + 8$ or $8 + 12$
(5) $t - 5$
(6) $2c + 3$ or $c + 2c$
(7) $4m - 6$
(8) $7-(2 + x)$ or $7-(x + 2)$
(9) $5(2+y)$ or $5(y+2)$
(10) $(3x)^2$
(11) $(3+x)^2$ or $(x+3)^2$

VIII. D. 1. b) (1) Five more than a number
(2) x less than three
(3) The sum of a and b
(4) Three less than five times a number

VIII. D. 2. a) (1) $2x + 16 = 86$
The number is 35.

(2) $3n - 17 = 43$
The number is 20.

b) (1) $x + (x+1) = 35$
The integers are 17 and 18.

(2) $x + (x+2) + (x+4) = 105$
The integers are 33, 35, and 37.

(3) $4(x+4) - 5x = 26$
The integers are 10, 12, and 14.

c) (1) $2(2w+3) + 2w = 30$
The width is 4 cm and the length is 11 cm.

(2) $x + (2x+3) + (4x-2) = 22$
The lengths of the sides are 3 cm, 9 cm, and 10 cm.

d) (1) $50t + 60t = 660$
The time is 6 hours.

(2) $3x + 4(x+15) = 375$
The rate of the bus is 45 mi/hr and that of the train is 60 mi/hr.

e) (1) $.1(q+4) + .25(q) = 2.15$
She has 9 dimes.

(2) $.05(q-24) + .1(q+17) + .25q = 21.3$
There are 28 nickels.

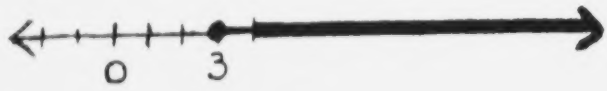
VIII. D. Linear equations; Problem solving

VIII. D. 2. f) (1) $x + (2x+3) = 39$
Emma is 12 years of age and Bob is 27.

(2) $4x + 5 = 3(x+5)$
Jack is 10 years of age.

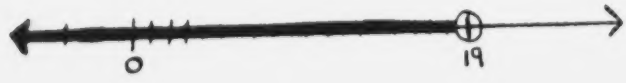
VIII. E. Linear equations and inequalities of one variable

VIII. E. 1) $x \geq 3$

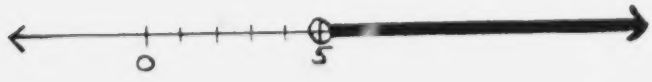


2) $x > 3$

3) $x < 19$

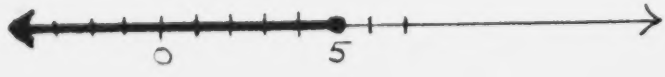


4) $x > 5$

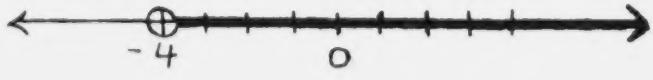


5) $x \leq -8$

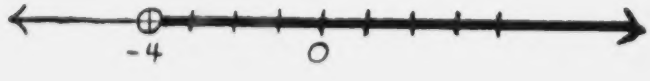
6) $x \leq 5$



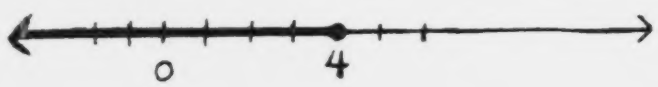
7) $x > -4$



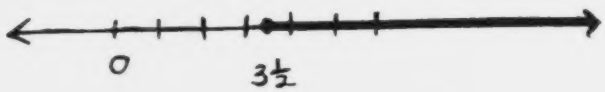
8) $x > -4$



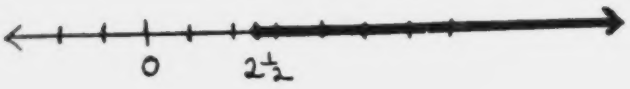
9) $x \leq 4$



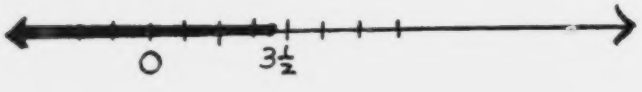
10) $x \geq \frac{7}{2}$ or $x \geq 3\frac{1}{2}$



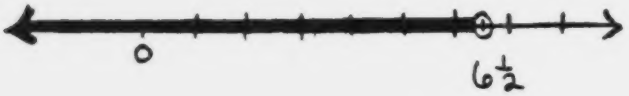
11) $x \geq 2\frac{1}{2}$



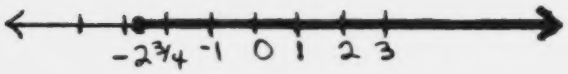
12) $x \leq 3\frac{1}{2}$



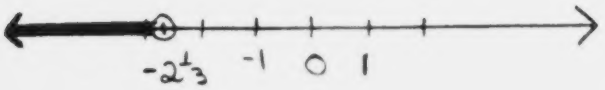
13) $x < 6\frac{1}{2}$



14) $x \geq -2\frac{3}{4}$



15) $x < -\frac{7}{3}$ or $x < -2\frac{1}{3}$

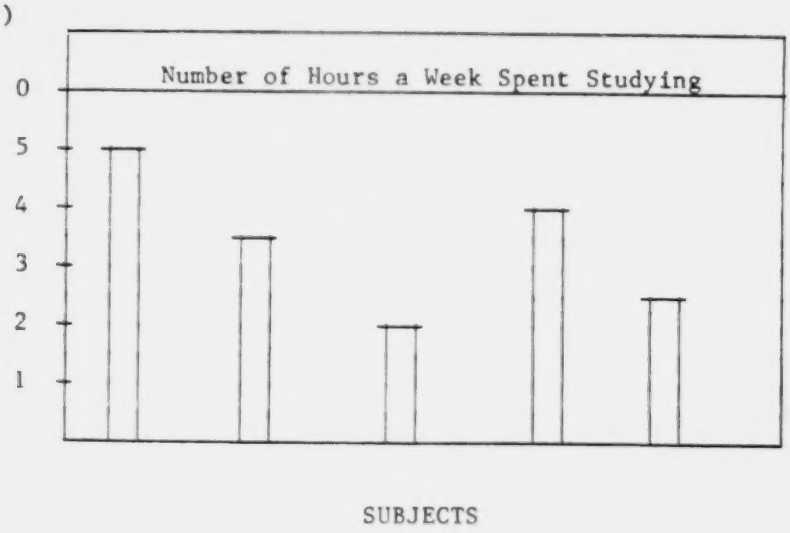


IX. Probability and statistics; Graphs

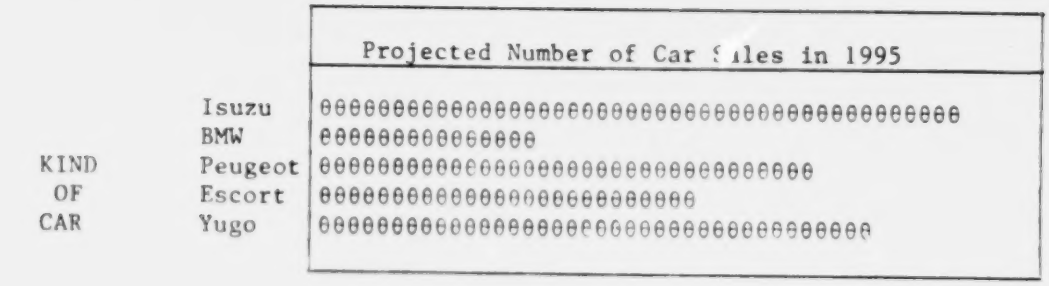
IX. A. 1. and 2. a) (1) 15,965,000

(2) 29.75% or 29.8%

b) (1)

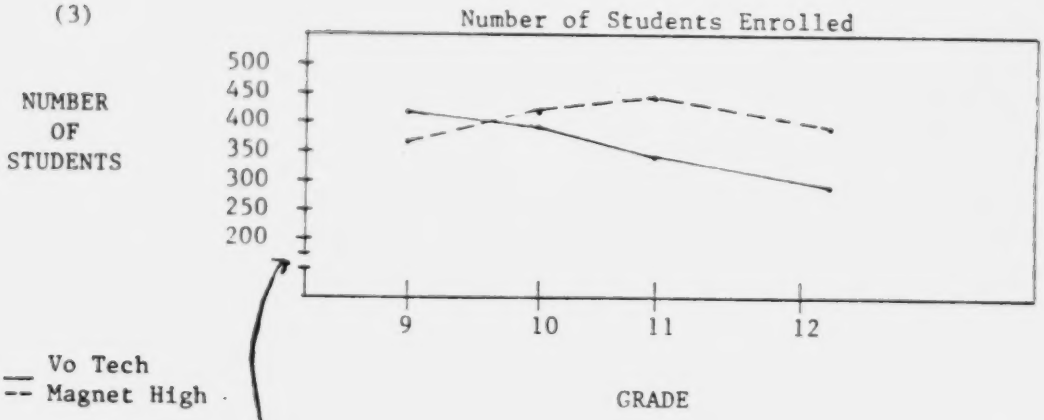


IX. A. 1. and 2.
b) (2)



θ = 10,000 cars

(3)



This shows that part of the scale is not included.

IX. Probability and statistics; Graphs

IX. A. 1. and 2. c) (1) 33%
(2) 2%
(3) 310

d) (1) Lawyers
(2) Teachers and nurses
(3) $5000

IX. B. Probability and statistics; Probability

IX. B. 1. and 2. a) (1) yes
(2) P(Heads) = .5 or $\frac{1}{2}$
(3) P(Tails) = .5 or $\frac{1}{2}$

b) (1) yes
(2) P(1) = $\frac{1}{3}$
(3) P(2) = $\frac{1}{3}$
(4) P(3) = $\frac{1}{3}$

c) (1) $\frac{1}{6}$
(2) $\frac{1}{6}$
(3) $\frac{1}{6}$

d) (1) $\frac{5}{11}$
(2) $\frac{4}{11}$
(3) $\frac{2}{11}$

IX. C. a) Mean: 30.5
Mode: 36
Median: 31
Range: 12

b) Mean: 19.25
Mode: 9.4
Median: 9.4
Range: .9

c) Mean: 88
Mode: 92
Median: 86
Range: 9

IX. Probability and statistics; Statistics

IX. D. a) 62,612
b) 13.5
c) (1) mean (3) mode
(2) median (4) range

d) (1) 100,455
(2) 35,150
(3) 12,580

e) (1) $P(\text{Black}) = \frac{50}{100} = \frac{1}{2} = 50\%$

(2) $P(\text{Black or white}) = \frac{50}{100} + \frac{30}{100} = \frac{80}{100} = \frac{4}{5} = 80\%$

(3) $P(\text{Blue}) = \frac{20}{100} = \frac{1}{5} = 20\%$

X. Geometry

X. A. 1. a) A pencil point
b) Where walls meet the floor
c) A page in a book

X. A. 2. a)

b)

X. E. 6. a) yes c) no
b) no d) yes

X. Geometry; Quadrilaterals

X. F. 3. a) 15 cm^2 ($A=\frac{1}{2}h(b_1+b_2)$)
b) 25 cm^2 ($A = s^2$)
c) 48 m^2 ($A = bh$)
d) 12m^2 ($A = lw$)

X. H. Geometry; Problem solving

X. H. 1. a) cylinder = 58,875m^3 ($V = \pi r^2 h$)

cone = 19,625m^3 ($V = \frac{1}{3} \pi r^2 h$)

b) pyramid = 213.3m^3 ($V = \frac{1}{3} s^2 h$)

c) 145,595.52 $in.^3$ ($V = \frac{4}{3} \pi r^3$)

d) cube = 512 cm^3 ($V = s^3$)

rectangular solid = 160 cm^3 ($V = lwh$)

X. H. 2. a) 14,520 $yd.^2$

b) 4.1332 m^2

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